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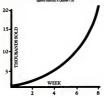
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COVER STORY Power Corrupts

(But You Can Protect Your PC)



those little socket boxes that you plug your PC and peripherals into? No one seemed to know. So PC Magazine Labs torture-tested 34 surge suppressors and came up with some surprising





FEATURES

SOFTWARE Guru: Brave New Expert System? John Helliwell/Take an expert system and integrate it with five

Desktop Organizers:

Top-Notch Efficiency Tools Diane Burns, S. Venit, and Vincent Pugliat The PC takes up a lot of space, but not when you consider the office equipment it can replace. Want to send your Rolodex, calendar, clock, calculator, and notepad the way of the typewriter? Take a look at the five programs reviewed



The Quest for Style Robin Raskin/Every office— even those containing good writers—needs an editor.

HARDWARE

One, Two, Breakthrough: The Core HC25 Wim L. Rosch" "Exclusive" alert. When the hardware fairs grapevine began buzzing, we knew we had to be the first hardware fairs in the country to tear into it. What's so exciting about another hard disk drive? Imagine a fat quarter-gigabyte of storage, add the fastest access times ever, and you



COMPUTERS The Tandy 3000 HD: A Fraternal Twin of the

PC AT

David Obregón/Tandy has

come around from its early

non-IBM-compatible forays

into the personal computer

market. One thing's for sure:

Tandy's newest—a hard disk,

80286-based machine—means

business.

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PC NEWS

IBM's new laptop, faster ATs. an analysis of copy protection's future, and a first look at Microsoft Word 3.0. Also,

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ADVERTISERS.. Cover Photograph: Shig Ikeda

WHAT'S INSIDE



Charles Rodriguez (at left), PC Magazine Labs technician. spends the greater part of his day making things work. Or at least that's what he did until "power regulation" came up on the editorial calendar. Rodriguez likens his assignment for this issue to violating the Hip-

pocratic oath, "We had to do two things," he recalls, "hurl artificial lightning at surge protectors and then zap it directly at the PC's own power supply. Do you know how much damage 6,000 volts can cause?"

Which was exactly the point. No one had any idea what 6 kilo-POPDIR 243 volts (50 times the standard office supply) might do. We did know that electrical surges are like snowflakes; no two are exactly alike. We also knew that multithousand-volt peaks are not uncommon in most offices. This makes it hard to devise a set of tests rigorous enough to single out the winners and the losers. And, in this case, losing can mean losing big.

To develop tests that would meet PC Labs standards, producttesting editor Mike O'Cone and contributing editor Phil Wiswell traveled across the country and sought advice from some of the nation's leading authorities on power regulation. The results translated into 384 individual procedures per device that took over 300

lab-hours to perform.

Rodriguez managed the testing and also reassured skittish software reviewers who were in the Labs evaluating programs for the upcoming database blockbuster in issue 12. The labs were ringed with extra fire extinguishers, and Rodriguez cautioned everyone working near the KeyTek IEEE-587 surge generator to remove rings, watches, and jewelry. While the reviewers all came through unscathed, several of the products did not (page 115).

Associate editor Jennifer de Jong turned to contributing editor Winn Rosch to write our front-end piece on PCs and power (page 106). Rosch was just right for the assignment; he not only holds a degree in electrical engineering, but he was also the author of our last cover story on power in March 1983. Rosch will be closely involved with our upcoming reviews of uninterruptible and standby power supplies.

Rosch exhausted the topic of PCs and power just in time to take a PC Magazine exclusive look at the new high-performance, highcapacity drive from Core International. The Core HC25 made quite a spectacular showing; the review begins on page 181.

In our first issue this year, we reported on copy-protection schemes and protection-busting products. Since then, more companies have abandoned the whole idea of conv protection. Will the walls come tumbling all the way down? A report by Stewart Alson and Charlie Bermant in PC News.

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LETTERS TO PC MAGAZINE



FINDING THE RIGHT WORDS

Until reading your article "The Business of Words" in PC Magazine (Volume 5 Number 2), I was never able to adequately verbalize why I liked DisplayWrite 2 for



our corporate offices, WordStar for my own use, and possibly a third separate alternative for our small retail offices. My only regret about my new-found insight is that I now feel I have two or three more packages to look at.

Steven J. Hausman Greensboro, North Carolina

WORDS OF FRUSTRATION

Your cover line "PC Labs Puts Word Processors in Their Place..." is a catchy phrase that suggests scientific objectivity—an objectivity that was sadly missing in Craig L. Stark's review of Spellbinder, Version 5.40 ("The Business of Words: Professional").

His comments were not so much a review as they were an expression of firstration with a highly complex program that cannot be fully appreciated in a matter of a few hours, days, weeks, or even months. Lexisoft line. should have done better with its documentation. Its advertising brochures are much easier to understand than its manuals! Other than that, Mrs. Lincoln, your January 28 issue was just great. Al Henderson Hinsdale, Illinois

Craig L. Stark replies: Having spent weeks (though not months) trying to appreciate Spellbinder's complexities, I quite admit to being frustrated by them. So, I suspect, would most readers, especially when they could have been using faster, easier-to-use programs with better documentation and no less power.

WILD WORDS

Dawn Gordon's critique of Wordbergher, Version 4.1 ("The Business of Words: Professional"), stated that "search and replace is not case sensitive" and "widcards are not supported" in that mode. Checking the reference manual under replace proves otherwise: "Lowercase characters will match both lowercase and uppercase. Uppercase will match only uppercase. Cut-W will match any character except a function code, but should not be the first character in a string."

John York Denver, Colorado

FIGHTING WORDS

A programmable word processor such as EdixWordix, included in The Professional Writer's Package, Version 2.0 (The Business of Words: Professional), is important for those times when offices outgrow their WYSIWYG (what you see is what you set) word processor.

Wordix will do complex tasks, but it is a bit tough to explain this to a secretary who is on her second day with the system and has never programmed. That's why Emerging Technology's support is the best I have known. Not only is it a help with

weird requests, but it also has written macros for the college I work for and mailed them on disk—totally free! Ted Hommel



W W W JS

Scottsbluff, Nebraska

Edix, the text editor part of Emerging Technology's Professional Write's Package, is not "slow with screen operations in general" as you claim. It's much faster than λyWrite II Plus, Version 2.0, which you often proclaim as "blazingly fast." The fault lies with the IBM colorigraphics board, which makes snow on the screen unless stulifying measures are taken. It you see Edix with a monochrome card, you'll find that all of Edit's screen operations are truly instantaneous.

James A. Rome Oak Ridge, Tennessee

WORDS TO THE WISE

The Leading Edge Word Processor, Version 1.3, reviewed in "The Business of Words: Corporate," has one major flaw you didn't mention it takes complete control of the keyboard, which means you can't access any of the resident programs available to PC users. Programs such as Spotlight, Deek Organizer, or PolyWindows DeskPlus (SideKick works, but only if you are very careful). In addition, the

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printers, not just dot matrix printers. Wide charts can be printed in strips Also works with Hewlett-Packard 7475A (and compatible) plotters . Twenty standard flowcharting shapes included . Common shapes supplied in three sizes · Extensive manual (125 pages) includes many examples . Context sensitive "help" facility provides immediate assistance at any time . Any number of titles can be placed on a chart

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The sample screen display shown below is typical of what you see while editing a chart. Other screen displays are provided for entering titles, changing options, getting "help" and so on.

STATUS BAR (not to be CHART WINDOW gives an overview of your chart; this example shows the "normal" view. "Close-up" view shows a smaller part of the chart in more data! "Wide-angle" view confused with e well ber) tells you what Interactive EasyFlow shows a larger part of the chart all reduced size. is doing all all times. TEXT/MESSAGE WINDOW used to enter the saturation user lext and to display messages from Interactive EasyFlow. CURRENT SHAPE WINOOW - shows the . content of the current flowchart shape (the one under the SHAPE CURSOR) in complete HavenTree Software Limited P.O. Box 1093-P SHAPE CURSOR shows where you are in the chart. Cursor keys move it around; chart

Thousand Island Park, NY 13692 (613) 544-6035 ext 49

window scralls if you run off the edge of the CIRCLE 201 ON READER SERVICE CARD

■ LETTERS

most important resident won't work; the terminal emulator that communicates with mainframes

> Peter Romanchuk Carlstadt, New Jersey

COMPREHENSIVE RETORT

PC Magazine's article "The PC Plays Tutor" on page 225 of the March 25th issue (Volume 5 Number 6) contains statements that are erroneous and contain negative implications concerning Comprehensive Software. The statement that "Companies such as Comprehensive Software Inc. ...

are no longer distributing applications training products" is untrue.

Comprehensive Software has never distributed applications training products for the IBM PC. Our computer-based training programs, called The Intro Series, are generic in nature. They teach about computer literacy, concentrating on why a category of software might be used, and give interactive practice exercises on several different application packages within one tutorial. For example, our Introduction to Communications product features the IBM Personal Communications Manager, Crosstalk, The Source, CompuServe, and Dow Jones, as well as bulletin board online systems. We also discuss hardware options for communications and LAN packages.

The only one of our IBM PC training programs that could be considered an applications tutorial is Introduction to the Operating System (also known as PC TU-TOR). PC TUTOR covers the concepts behind an operating system and its file structure and goes on to give extensive details and practice with PC DOS. PC TUTOR enjoys what might be the widest distribution of any such tutorial. It is autoenclosed with PCs shipped by NCR, Cordata,

 Comprehensive Software's computer-based training programs are generic in nature.

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■ LETTERS

Wang, and other manufacturers. It is carried by national distributors such as Softsel and First Software and appears on the shelves of dealers such as Computerland and IBM Product Centers. PC TUTOR is also used by several large corporations and government agencies; some even site-li-

cense it. The article gives the impression that Comprehensive Software is no longer active in the computer-based training arena. To the contrary, our last fiscal year was the most profitable in our 5-year existence. We will be introducing several new offthe-shelf training products this year, and we will continue to develop custom tutorials. We are very busy and very optimistic about 1986. So far we are on target for a better year than the last one!

I hope that any future articles on computer-based training are more accurately researched. Please call us next time and find out how we're doing before you print anything about Comprehensive Software.

Rick Lane Comprehensive Software Redondo Beach, California

PC Magazine did not intend to suggest that Comprehensive Software is no longer active in the computer-based training arena. Comprehensive Software has a growing line of computer-based training products .- Ed.

DEBATING PROJECT MANAGEMENT The article "Project Management Software: The Top Sellers" (PC Magazine,



Brown. Bruce which appeared in your February 11, 1986, issue, doesn't fairly represent SuperProject. In each case where the authors expressed an objection (for exam-

ple, lack of resource leveling), the new version of the product, SuperProject Plus, met all criteria with ease. In conjunction with the authors' objections, there were also inaccuracies. For instance, the "at a glance" matrix states that the number of resources per task is five, when in actuality it is unlimited.

These omissions and inaccuracies are especially surprising because Mr. Brown was in possession of full information on SuperProject Plus. The product was announced at Fall '85 Comdex, and Mr. Brown had discussed it at length with our

■ PC Magazine's policy is to review only those products that are in full production.

marketing manager and had received the product literature. A correct representation would have at least mentioned SuperProject Plus and its capabilities.

Michael K. Crosno Computer Associates San Jose, California

PC Magazine's policy is to review only those products that are in full production. While we welcome the power of SuperProiect Plus, it was in beta form during our testing period. The (incorrect) number of resources auoted in our articles came from

Computer Associates' technical support department In view of the massive changes that have taken place in the past several

months, we will take a fresh look at project management software this fall .- Ed. HOW TO WRITE TO PC MAGAZINE

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WINDOWS for C/WINDOWS for DATA Give Your Program a Clearer Outlook

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Loncal treatment of video attributes permits unchanged programs to run on color or monochrome. Colors of wandows All functions are in separate modules, only those used are linked. Only buffers becased wandows occupy RAM; others released dynamically TopView

compenible. Best overall rating and fastest display in Bill Hunt's 7/85 Week Journal review of five windowing products.

Windows for Data comprises all of
Windows for C but takes in data through the windows as well. At the high level a engle function lets you enough prompt string, field length, data type, screen location, picture, target variable, then sets process a uses's input - any of which functions are available directly There are utilities to get system date and time, mess with strings, create your own field masis: Field options can require entry, prevent

messages or validate entires. And you decide which large will clear a field, jump to the next or prior, crut. etc. Options Specify Compiler T0100 Windows for C 195 TO(50 Windows for Date *296

diverse enough that a set of "fields" can be made to behave like a Lotus" menu. Many compilers. Pree demo. Lest PC Brand

C-WORTHY LIBRARY

M any libranes launch Botilies of func-tions for small crafting — re-working of strings, positioning the cursor, etc. Cbethy by contrast is a formidable battle wagon for major C engagements.
The C-Worthy Library wasps an entire user interface around your application its full power can be summoned by only a few high level calls. Sound exaggerated? A single function call can set up a complete test editor in a screen window High level calls non manus and ormit able choose lists to the screen, restoring the background when damassed, and branching to the chosen activity in your appiscence. A full function set handles ubly-linked lists defined by C struct

 Windowing faculties open portholes of up to screen size for viewing virtual. ens larger than the physical screen. entry, permit used or overtype, beeping . Pall context sensitive help screen man agement takes over this chore. Keyboard entry routines look for the help key on their chment of field-specific help message own and interrupt with pageable text win

C-TREE

B-Tree File Manager, Source Code, No Royalties!

 4ree™ has been around since 1979 C (it became Digital Research's Access Manager 19). That means seasoned, sturdy

on awalid or overflow keystrokes, and

and functions you want called to display

weight of prolonged and widespread use O-tree comes in C source code, revesting all you've over wanted to know about how b-trees are written. Provided you band a imo your pinary application, you can re

distribute Circle without royalties tree's design splits nodes to allow an number of users to access an index file simultaneously even when updates are in progress. So multi-user configurations and adaptation to networks are possible. You must write second locking soutines, as they age compiler and operating system dependent, but shows how.
Thanks to source code which does not deviate from the K&R standard, C-tree can

travel Tests in many environments prove that C-tree gives your application a ticket tree permits any number of lows for a

data file, supports duplicate loys, variable record length files, multiple key indexes in a single file, etc., etc. - it's a comprehen-uve product with everything you'd expect Intelligently designed, too. Both high level handling all details of an activity, as well as decomposed step-by-step functions wu can access directly Either way C-tree ord you seek amonast a

F0660 1398 1329 BACK GUARANTEE product returned within 30 days in ennotice returned was at 30 cays and an arrange resallable condition. You can even try out programs them-selves if product code begins with E. T, or L shrough N - even if a means breaking the disk seal. Some developers do pose limits, so lor prodducts beginning with other letters. opening sealed disks constitutes acceptance But you can at least review the manual. There's just nothing stop-ong your buying from PC Brand.

PIPE THIS ONE ABOARD! Fits Out Applications with Shipshape Interface

ws explaining what to do next Full error message interface sends error codes and the functions which return them to C. Worthy which counsels user, you get to remove all that error checking clutter Your application is nested in these werful emissaries to the outside world. powerful emissanes to the outside warm. C-Worthy's imaginative architecture then makes heavy use of C's pointers to fanctions to find its way into your application to act upon the user's request Separate utilities maintain help and error message test and lists in files. This test segregation means applications can read-

ly translate into foreign languages without programming - doubly so because C Worthy display routines automatically resize for text length Where the high level interface does not sut you, the low level routines are available as decomposed functions. All machine dependency such as key mapping is housed

in interchangeable overlaps loaded along ade the application at run-time. CWorth ors can thus run on a mox of PC CWintly hands you a consident and inautive interface and a revolutionary des approach. Novell found it "played a key

role and accelerated development in making its NetWareTM unlines easier for users. "You owe if to yourselves to take a look." Banary Lattice. Others coming. Ingenious demo call for it. Lest PC Brand. *295 *269 *465 *449 Ask for:

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eled language which delivers M

knows how to swap modules of large

a displaced overlay to which a subse

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quertly called overlay must return, and

DAN BRICKLIN'S DEMO PROGRAM Slide Show Your Latest Greatest Idea W hen the unreator of the electronic

gram, we sat straight up in our chair. VisiCalcTM was for businessmen, but latest in for us programmers Ever had trouble putting a program idea don't work. The answer? Show your program as a procession of screens. Dan's new program makes it easy it

creates side shows that imiste a program's screens and sequential activity Create a screen - a snapshot of your med product as it runs. Anything go box omount solor work enghand whenever underlang of monochrome, Stregaround and background color on the CGA and EGA Press a key and make a copy of the "side", change it a little by a service. character perhaps, to show the next cratant of run-time, then copy the slide forward again. Create a whole slide show of your program in action. It will seem like the

rogram dself is nurning. Each screen is in 80x25 character mode. not be mapped graphics. All 250 characsers and attributes are available from acrollable lists which pop to the acroen. All commands are layered in Lotus-style pop to menus, with frequent charges mapped to the function keys as well sand line options relax such rigor dur-Screen areas can be blocked for cut and paste or filled with color or characters, even made to blink. Sides of oft-appearing segments can be made for overlaying on

segments can be made no demograph of other sides, and any side may have several overlays assigned to it. Sides can be shuffled, deleted ... many quick tools to save time, disk space Slides can proceed at time interval perponse to keystroken, and depending on a user's response, was can tell the program

VERSION 4.0

BTRIEVE Queen-B File Manager Abdicates Royalties This queen of b-tree file menagers was So it's quite a ukase indeed that one need

no longer pay a tithe to incorporate neve^{ne} in applications whom royalties would rum profit margins Now there is version 4.0, which hundrily speeds DOS interaction, especially for PLINK86 & PLUS arce files with multiple keys. It also adds Dynamic Cache Overlays support for variable length records of var-tually any length. Other new features: a read after write option to varify accuracy. Maximize Memory Use

useful in grifty environments like manufe turing floors, the password to deny unau-thorized access or read only, and date P link86TM long the overload of overlay linkers, now has a Plus version. As a linker Pink can be used with any comencryption to assure network privacpiled language warra on a piled automatic tneve's foundation is a balanced-nee symbol tables and more memory maps than DCS LINK, but its overlay power has indexing scheme, conceded to be the fastest search technique devised (if will find any key in a milition-plus sem index in four or less accesses). Bitneve takes complete won its reputation as a miracle worker Pluk86 shoe-homs large programs into small memory by binding into your comcharge of all file creation, indexing, reading, writing, insertion, deletion, space piled program an overlay manager which capture, and forward and backward larked programs between dask and shared memory space. Plank86's straightforward searching based on full or partial keys. In you use in the form of functions you call to

overlay description language allows you to describe your overlay fuerachy in a structure permitting up to 4 095 overlays stacked 32 deep. Bineve has mainframe specifications! A single file may have up to 24 indicases. Seg-ments of keys may be indicated. Each index can independently accept or block So if your program needs large chunks of memory, you no longer forego sales to folio who have less. But if you've assumed 128k, and they have 640k, Plink96 PlusTM be up to 4090 characters; variable length records 64k; indexes 255 characters; file-up to 4 billion bytes. It can even extend a knows to use extra memory as cache for quartary - at full speed compared to disk

file across two drives-even two band awacong, it also can automatically restore laterfaces to C. Pescal, BASIC, and COBOL with single purchase, sample pro-

grams in all four languages.
The network version works with any network that supports the MS-DCS 3.1 file sharing function.

function and grades you through asynchronous communications

to branch anywhere in the slide sequence to create unsumerable paths through your

show

Don't make your ideas struggle through coding to get to the screen. Dan't Demo is enaluable to prototype the program you are about to write, to position all the labels, choose the color decor, smooth out the isystroke galeriace before a gets etched in code. Or load the "capture" utility above the operating pistern, snapshot the arrework of any nurning program, and load an unstant slide show into Danis program Makes tutorials a snap

Demo has biosomed throughout we hear "Lotus (was) any major Lotus", we bear test sale", says Brickin.
Each purchase entales you to red tribute fifty copies of the side projector program along with your show Plain manual, no binder, to keep the price low because Dan thinks everyone should have one (he's note). You'll wish be had Demo then and left Vas/Calc for now (Needs

169 GREENLEAF

LIBRARIES FUNCTIONS New 30 has 225 functions in both C and

membier acurce as well as library form We have versions for Lation, Microsoft. 26, Mark Wms. New emphases on tigh functional groupings to minimize excess baggage of functions loaded whether used or not Manual's 200 pages now help select functions, as do demos and builetin board 32 DOS extensions: file and directory manupulation for 20 and 11 23 Screen Functions. Select mode, page, monochrome or color, palette, cursor shape postioning, cleaning and scrolling, point get and put, read light pen. 80 Str. Punctions. Manapulation of strings.

runctions, Manapulation of scrargs, including center and justify, efficient last operations which add, delete, and sort pounters to strongs for top speed. 50 Graphic & Printing Punctions, Primitives to access all graphics, typelace, formatting, and forms control. Plus keyboard status and function key assignment, time and date algorithms, read registers, memory size, peek and poke Asir fre

COMMUNICATIONS Wiret your application to communace

with other upers or remote date bases? Now you can build asynchronous communications right into your C programs! Over 60 functions and demo programs in both C and assembler sourceode set up an interrupt driven achieves. with separate transmit and receive ring buffers (characters are simultaneously loaded at one end and transmitted from you can download a record, then hall ncoming stream to file it, display it, let the

user tamper with it, send it back up line. It all happens within the context of your program Goodbye separate communications The Greenleaf Comm Library supports ASCII or binary, any parey, any word length, 8250 UARTIs, all four Lamce C memory models, Hayes 300,1200,1200B and Its 80-page manual has examples of each

BASTOC Translates BASI Programs Into C

F or a traffing price. BASTOC™ will move truckloads of BASIC code over to C is a a translator which takes in Micro-soft Extended of CBASIC and emits pure Kernighan & Ratchie C for the Lettice com-

pairs it will optionally convert your pro-gram into a single monolithic C function or will decompose it into separate functions, one for each GOSUB label. Version 2.0 adds optimization, with dra matic reductions in essection time. It con-verts to C integers those numeric variables it finds in BASIC programs which reality do not need floating point. It aliminates unreachable code. Where BASIC uses full assignment statement increment and decrement counter, BASIC TO corrects to C is compact form, needed no other statements. Straigs are dynamiatic reductions in execution time. It con-

in other statements, sorings are dynami-cally allocated in the target program, not-ding your application of BASIC's catatonal halts for garbage collection. BASTOC will try to create structure of even the most convoluted BASIC code, and writes any indigestible statement into the C output as a comment accompanied by an explanation of the problem. Also you can optionally tell BASTOC to inser BASIC source lines into the C target as ferences between the languages.

specify: Last PC B 50375 & Which BASIC 495 13

PANEL Feature-Laden Screen Design Tool

The newest version of this premier pro gramming tool lets you layer your screen designs with up to ten overlappen mages, making it easy to background a screen with pop-up late, help boxes, and alternate sets of input fields. Writing your own screenware is a good way to blow completion dates and profits. PanelTM works with you interactively to set up foolproof screen displays and data en-try forms rapadly. It tests your form to prove that it (and test data) behave correctly, then conserts the feashed work into C source code for incorporation into your applica-tion. Compile with Lattice or Microsoft. Wonderfully diverse strabutes may be selected for any field - size, data type color, of course, but also convects

data when new entry is started; masks for standard formats (eg. dates, phone numbers), a choice of styles for numeric fields phrases which fill in when their first letter is typed, multiple-choice lists from which to choose a field fill-in by cursoring a high lighted bar. Fields may be multi-lined (eg. name and address as one field) and scrolled if larger than the screen space Panel builds in a user interface for systecise movement within and between

input to upper case; clearance of existing

routines for checking user field entries rounes for creeking user send entries— in source code, so you can tack on your own unique variants. Screen designs may be dynamically loaded from file, or compiled into a program, and version 6 has optimized code to quicken display speed.
The whole package is wrapped in a monitor and keyboard customization. package to tailor your application for other equipment. Panel: A superior productivity tool now bigger than ever.

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programs root segment or overlay areas Plink, the programmer's choice even when CP/M^{PM} was the poolsah of

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RUN/C PROFESSIONAL VERSION Interpreter Now Accesses Binary Libraries

R UN/C was an innovator for conventng inaccessible compiled C to an interpreted language as easy to grab hold of as BASIC Great for learning. but a problem remained for pros An interpreter expects nothing but source code, and that put the vast resource of professional binary libraries off limits.

No longer RUN/C Professional M has the tools dynamically to load and unload multiple binary function libraries while in its interpreter. Your code can now reach for functions in the commercial C libraries like C-Food Smorgasboed FM opposite - posentially any library com piled with Lattice's large model. How e manual shows how to develop the merface to a library, using the Latice compiler (a mustly. How about your own archive of functions? No reason why not

The RUN/C Interpreter

The interpreting engine lies at the heart of both the improved original RUN/C and the new Professional vertion. Its creators had the imprastion to make cone formatable C behave on acreen much like PC ASIC with a failt of the control of the cont version. Its creators had the inspirat

nd your typos and malaprops RUN/C has a treasury of functions built into the interpreter - over 100 paralleling the most used fund ound in standard compiler libraries. So when and if the time comes to compile, your source code will find counterparts There are lots more features - system interrupts, a shell command to invoke any operating system command without leaving RUN/C, even the ability to load a preferred editor in parallel and switch

RUN/C Standard Version Straight RUN/C has all above but the oadable Libraries TM docking module It utilizes source code only, whether ated by #s own editor, or from any ASCII file, such as programs you've already written, or commercial libraries

back and forth

which supply source code
It makes a splendid teacher. The manual has not just instructions how to use RUN/C, but its 500 plus pages provide a thorough going demonstra-tion of the Clanguage itself. Every feature, of C or RUN/C, is accorded in

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TERMS AND COR

own micro-chapter. Over 100 of these chapters are devoted to RUN/C's builtin functions, and every one lists a sa program showing how it is used programs are also on the disks. So as you read them in the manual, you monthe screen (Needs 180k-256k recommended.)

RUN/C Professional

RUN/C Pro has every feature of RUN/C regular plus the binary library link-up and an extra level of debugging aids. They are ingeniously installed behind a built in function, so you can cal for debugging conditionally. The called for debugging conditionally. The calles function paints a menu of debugging tools to choose from, including immediate mode to display variables, single-step tracing, and changing of variables

RIIN/C Professional can tackle. projects of any size. Use it as a creative front end to feed a continuous stream of source code into compiled modules. Only the source work in progress is still interpreted, the finished modules will whiz by at object speeds. It will change how you work. (320k minimum and 5) 2k commended to fit libraries.)

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ANSI Computer Graphics Interface (CGI)

At the heart of the system is now the Development Toolkit which contains all

language interfaces and device drivers

printers, plotters, cameras, and more. Drivers now house all management of vec-

by rashes (plotters) and himspe used by rashes (plotters) and himspe used by rashes input devices (scanners) to insu-late completely the application program

from concern for device ideosyncracy. No one else has implemented CGI that way It

just switch drivers and the same program will drive a different device, including

intelligent controllers which do not want

GSS Kernel^{rss} conforms to level 2b of ANSI's Graphical Kernel System (GKS)

and contains all its needed drivers and language bindings. Kernel has mecro

level tools to draw and color an object,

store the sequential instructions, and recreate the object on its own, as well as segment it, transform it, etc., all the while

ale command may represent severa score lower level statements

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Plotting has the equivalent GKS tools for graph and chart generation and their cap

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LATTICE C VERSION 3.0 Major Upgrades to the Best Selling C Compiler

amoe has labored and come forth the with the long-sewised Version 3.0 of its top-rated compaier. A long has of enhancements, adoption of the ANSI draft standard, documentation ravaled by few, and add-on sibraness matched by some or desired present profession of the sibraness matched by some or desired present profession of the sibraness matched by some or desired present profession of the sibraness matched by some or desired present profession of the sibraness and the sibraness of the sibraness Lattoe now embraces key UNIX[™] enhancements which have entered the language since Kernighan & Rachie word

functions returning no value, enumerated carcions returning to value (minnerates) class types to assign stepped values to variables, the ability to pass data between structures by assignment statements. And 3.0 adopts checking of external function arguments by data type as proposed by ANSI to kill bug swarms when modules. poinup at link time.
The greatly expanded libraries, now comprising 335 functions(), enable the file

sharing and record locking provisions of DOS 3.1, provide a full complement of transcendentals, and a host of utilities to manus the UNIX and XENDY envi Lettice now delivers smaller EXE files curing one past complaint, boasts very fast link times and a more efficient alias

algorithm.
The compiler now defaults to the ANSI proposed standard when you need a strict mistress, but command line options toler-

ate straying. New options generate code to use 80196 and 80296 features, and the

"pre", and it bakes the numbers into a

Kernel and Plotting have tools to come images they create to ANSI Computer Graphics Metafiles (CGMs), a tolerused

reads the contents of a CGM and inter-prets it with full CGI capability for re-ci

Unit royalties and annual fees have

GS040 Menafile Interpreter *250

and paste before di

ANSI CGI STANDARDI

ay for screen or plotters

8087 is of course sensed and utilized at Lamoe has envoyed pre-emprence so

long that developers have created far more tools to marry into Lattice C than any other compiler. Programmers now have rmous resource of libraries and utilmes to use with Lattice to speed theu work Wilsem Hunt in his exhaustree and ysa of 12 compilers in the 1/86 issue of the PC Tech journal awards Lattice the only "very good" rating for add-on library availability He sums up with this all-around accollade. "a fine product to con-sider for the production of important appli-

Ask for

BETTER BASIC New Version Compatible with Microsoft BASICs T his hearty implementation provides a

real alternative to technical languages on C it melds the most useful features of C. Pascal, and Modula 2 anto BASIC, while already known to millions. And now Verson 2 0 is 100% compatible with Micro-soft's GWTM BASIC and IBM BASICA including graphics, sound, and assembly language calls just load old programs and run Save and they are converted to BetterBASIC

ft's big: BenerBASIC's hapely expanded features require 192k, your programs can go all the way to the PC's full 640k. It's comfy. Behaves like Microsoft BASIC at the interactive level, with a full-screen edifor direct statement execution, and always possed to RUN It's fast BB is an incremen position from the state. So is an increment all compiler—unlike with unexpecters each stoement is checked and compiled just once. The Sawe benchmark runs sur times faster than with Microsoft. Bettet BASIC® has C-like structures for standard for storing every form of graphic image as data. The Metable Intercreter

tre records so say goo bye to FIELD, MKI\$, CVD, LSET, etc. It has tion on various devices, and you can cut "procedures" summoned by name unli GCSUBs Lots more testures built in nd paste before display Quality software? IBM thinks so. They ell the GSS series under their own label Inixer for compiled modules, trace; debugging breakpoints, cross-reference command, 32k strings, DOS and BIOS

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Because your expansion unti included a ROM update ki, you essentially have an XI and should have no problems using any of the hard disks sold for the XT. Since you'll be running two separate hard disks, we recommend you upgrade to DOS 3, (available at IBM Product Centers; \$85) for its better hard disk utilities (such as SUBST) if you known I already.

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The market is chock-full of competitors: Seagate, Everex, and Maynard Electron-

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of screen glare: circular polarizers, linear polarizers, and fine meshes. The prices of these devices range from about \$30 to \$135. I find it very difficult to make a purchase without knowing the pros and cons of each type. Can you shed some light on this subject?

Richard Marrocco

Eugene, Oregon

Before you look at filters for your screen, consider the sources of the problem: strong overhead light and an excessively reflective screen.

IBM's first-generation color manitors begree. Their current ECD Ethaneed Color Display) monitors do not, nor do some recently introduced displays from Amdek, Princeton Graphics, and others that have etched, rather than polished, glass tubes.

Adjusting room lighting is probably the single most effective way to prevent glare. Try using a carefully placed lamp in an otherwise dark room. Or adjust the posi-

tion of the screen; looking head-on is usually the worst position.

Of course, these suggestions are not practical in most office environments, and

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Dark, fine-mesh screen covers are the least expensive but are adequate only when there's a small amount of glare Also, the fibers create a small amount of glare themselves and distort color images remained and the Screen, Stretch Devices, Philadelphia, Pa. (800) 523-694; in Pa. (215) 739-3000; available in six sixes to fit most montions: about \$50.

Circular polarizers are best for allaround office use; they absorb reflected light and should display only the light coming from the monitor. Polarization has the added benefit of increasing contrast, offering a sharper image. Linear polarizers generally are used to screen out or emphasize a specific color, not to reduce glare.

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For the IBM PC, AT and 286 compatibles 80287-8 8mhz.... For the Tandy 3000 and ITT-XP 287Turbo" 8mhz if you own an AT.

Deskpro 256 or 4T compatible, this is the card you need to get reasonable numeric performance, plugs into your 80287 societ and includes a epe-cially driven 8mhz 80287. The card comes in three configurations. The IBM AT version includes hardware RESET button. \$385 NEC V20, V30. 64K RAM Set 150ns..... \$10 256K RAM Set 150ns...... 128K RAM Set PC AT..... \$39 \$49 JRAM, AST, INTEL.

Dicache plus 84K ABOVE BOARD PS.

Dicache plus 128K AT ABOVE BOARD.

Microsoft Fortran Version 3.31

BM Professional Fortran.

By an McCatego Fortran Version 2.0

FORLIBE or STRINGS and THINGS.

Oralmatic for Fortran or Pascal.

NAG Fortran Library
Lattice C
Microsoft C or QuickBasic
IBM Basic Complier Version 20.
Summit BetterBASIC
Summit BetterBASIC
BIM Assembler of Librarian Version 20.
Microsoft Pascal Version 331
STSC APILE-PLUSPIC
Phoenix Plink86 or Cosmos Revelation.
SPSSYPC -SPSS/PC+
EPSILON Text Editor.
LABTECH NOTEBOOK
MuttiHalo (one language).
Fifth Generation FASTBACK



Remember the first time you upgraded your color graphics hardware? The thrill is still the same.

The discovery of color graphics. As a child, it was a significant event. As a business person, it will change the way you use your personal computer.

Genoa Systems proudly introduces a new and colorful technology for the PC called Spectra EGA. The Enhanced Graphics Adapter that lets you rediscover the benefits, and the thrill, of color graphics on your PC.

An EGA with a better vision.

EGA compatibility is an art that only Spectra has mastered. And, while other EGA hardware is incompatible with current industry standards, Spectra EGA fully supports hardware and software designed for the IBM Enhanced Graphics Adapter, Color Graphics Adapter, Color Graphics Adapter and Monochrome Graphics Adapter. And the Hercules Board.

This means that you don't have to wait around for new software updates in order to begin enjoying your EGA today.

A lot more than just pretty pictures. The first thing you'll rediscover

with your Spectra EGA is color. There is a whole lot more than ever before. Sixty-four separate colors, in fact, from which any sixteen can be displayed at once.

Next, you'll notice a higher resolution in both text and graphics modes.

The real fun comes in putting the board to work. You'll see soft scrolling, panning and windowing that was never before possible on a PC. And the flicker-free display will allow you to regulate these movements at any speed, or in

any direction.

There are 512 characters carried in Spectra's memory that can all

be displayed at once. Which is twice as many as previously possible on a PC.

And if you wish to use other characters, or even create your own alternate character set, Spectra will support those, too.

More colorful features.

Each Spectra EGA comes fully equipped with a parallel printer port, light pen interface and 256K RAM on the single board. This is especially good news because a full 256K RAM is needed to run most popular graphics software effectively.

One thrilling price.

Perhaps the best news is Spectra's price.

Upon first glance you may find that the Spectra EGA and the IBM EGA seem to be very closely priced. But look again. Because the standard IBM EGA only comes with 64K RAM, whereas Spectra EGA comes with a full 256K.

Now, you may purchase the extra memory board you'll need from IBM at an additional cost of about 70-80 percent. Or you can buy Spectra EGA from Genoa...and rediscover the thrill of a bargain.



Spectra Enhanced Graphics Adapter

To find out more about Spectra, or a qualified Genoa distributor near you, call 408-945-9720. Or write to Genoa Systems Corporation, 73 E. Trimble Road, San Jose, CA 95131.

Spectra EGA from Genoa. Evolution in color graphics.



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MicroWay is the world's leading retailer of 8087s and high performance PC upgrades. We stock a complete selection of 8087s that run at 5 and 8mhz. All of our coprocessors are shipped with a diagnostic disk and the best warranty in the business – one year We also offer daughterboards for socketless computers (NEC PC) and 287Turbo which increases the clock speed of the 80287 from 4 to 8 mhz. Our NUMBER SMASHER* includes 640K ram. It will run the IBM PC at clock speeds up to 10mhz and achieves a throughout of .1 megaflops with 87BASIC/INLINE, Intel Fortran, or Microsoft Fortran. Software reviewers consistently cite MicroWay software and 8087 expertise as the best in the industry! Our customers fre-quently write to thank us for recommending the correct software and hardware to meet their specific needs. They also thank us for our same day shipping! In addition to our own products which support the 8087 and 80287, we stock the largest supply of specialized software available. For in-

formation call us at 617-746-7341 FASTBREAK" employs the 8087 to increase the speed of Lotus 1-2-3" Ver engineering functions. Callable from

most 8087 compatible compilers Firs Language \$250; Additional \$100 A20-160" MicroWay's Data Acquis tion Board performs 160,000 12 bit Analog to Digital conversions per second Includes software drivers. The fastest 12 bit A to D board available. For the IBM PC or XT.....\$1295



8087 Support

For the IBM PC, PC XT, PC AT and Compatibles.

NUMBER SMASHER" The World's Fast-est Accelerator Card for the IBM PC, XT, and Com-patibles Includes an 8068 and 8087 pair tested to 10 mhz, and 640K bytes of high speed ram. Compatible with all software, operating systems and hardware! Your program speed is increased by a factor of 25 to 40. Pleating point programs by a factor of 2.5 to 4.0. Floating point programs nn up to 2.8 times faster on the PC than on an 80287 equipped PC AT. One of the few accelera-tors on the market which is compatible with all EMS cards includes FASTBREAK. \$1099

EMS cards includes FASTBREAK \$ 1099
87/88Turblo* is a stabbly card which includes a clock calendar and a speed controller which charges the speed of your motherboard from 47 to 7-4mhz. Its use requires your PC to have a societied 5224, 1950al speed increase a 18, 50mm comes the problem of slow hardware by slowing up only when six or which you have been seen as the problem of slow hardware by slowing up only when six or devices are accessed and running of full speed otherwise. It includes an 6067-2.

286TurboCache* This new MicroWay ac-celerator uses 8K of cache memory and 80286/ 80287 processors to provide an average speed increase of 3 to 1 for most programs. Call for specifications, benchmarks and price. MATRIXPAK" manages a MEGABYTE!

Written in assembly language, our runtime package accurately manipulates large matrices at very fast speeds. Includes maintx investion and the solution of simultaneous linear equations. Callable from RM or MS Fortran, MS Assembler, or 278AS/CIAI III III BASIC/INLINE each \$99

87BASICINILINE. each \$99
87FFT* whiten in assembly language, performs Forward end inverse FFTs on real and complex arrays which occupy up to 512k bytes of RAM. Also does convolutions, auto correlations, harmling, complex vector multiplication, and complex to radial conversions. Callable from most 5087 competities compilers. \$200

87FFT-2" performs two-dimensional FFTs.

P.O. Box 79 Kingston, Mass. 02364 USA (617) 746-7341 MegaPage[®] Our Intel-Lotus specification memory card. The only EMS board which comes with two megabytes of cool-running low power drain CMOS ram installed includes ram disk print DFixer" Our disk utility which thoroughly checks PC or AT hard disks for bad sectors and updates the MS DOS file allocation table accord-ingly. Solves the AT hard disk problem! ... \$149

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pieces needed for writing 8087/80287 assembly
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commonly used functions, including transpers
dentities, tragonometrica, conversions and Micro
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OBJ -- ASM* A multipless object module translator and disassembler. Produces assembly language fatings which include public symbols, owners toward symbols and labels commented with cross references, ideal for patching object modules for which source is not available.

\$200

8087 UPGRADES All MicroWay 8067s include a one year warranty, complete MicroWay Test Program and accurate Installation Instructions.

or the IBM PC, XT and compatible 8087-2 8mhz For Wang, AT&T, DeskPro, NEC, Leadin .\$149 80287-3 5mhz

For the IBM PC, AT and 286 oc 80287-8 8mhz For the Tandy 3000 and ITT-XP

For the Tandy 3000 and ITT-XP.

28.7 Turb0 * 8 mM.Z Il you own an AT,
Desixor 288 or AT compatible, this is the card you
need to get reasonable numeric performance. It
plugs into your 80287 socket and includes a specially driven Binns 80287. The card comes in three
configurations. The IBM AT version includes a
hardware RESET button. \$258. NEC V20, V30 .. CALL BAK RAM Set 150ns..... \$10 256K RAM Set 150ns. \$39 128K RAM Set PC AT. \$49

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Disache plus R4K ABOVE BOARD PS.
Disache plus 128K AT ABOVE BOARD.
Microsoft Fortran Version 331
IBM Professional Fortran Version 20
FORUMEN or STRINGS and THINGS.
Graffmalic of Fortran or Pascal CALL

Lattice C.
Microsoft C or QuickBasic
IBM Basic Compiler Version 2.0.....
Summit BetterBASIC*

Summil BetterBSIC* (CIBM Assembler w), Librarian Version 2.0. (CIBM Assembler w), Librarian Version 3.0. (Microsoft Pascal Version 3.3.) (Microsoft Pascal Version 3.3.) STSC APIL & PLUSPC.
Pricers PlinteBS or Cosmos Revelation. CSPSS/PCJ.
EPSILON Text Editor.
LASTECH MOTEBOOK.



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Activa Diminutes Grapuses stompter

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Spectra EGA from Genoa. Evolution in color graphics.



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TABLE 1 COMPARISON CHART RELATIVE RANK OF WP PACKAGES DISPLAY MULTIMATE WRITE 3 ADVANTAGE VERS. 1.0 AICROSOFT PERFECT VERS 35 WORDSTAR VERS 4.1 WORD VERS. 20 2000 PLUS REL 2 3 3 2 FEATURE 2 4 2 Installation 2 Occumentation 2 3 3 Ease of Learning 3 2 Functionality 2 Performance 3 2 2 Document Control 3 3 Text Control 3 2 2 3 Page Control 2 3 3 2 Micro Editing Global Control 2 3 Page Layout 3 2 Printing Advanced Features NOTE The transpirence numbers represent the relative transley of early speckage symmetric time offers. The package with the lateral package ground as the contract of the package with the lateral package ground as the package with the package ground as the package ground as the package with the package ground as the package ground ground as the package ground ground ground ground ground ground Writing Aids Printers/Fools Supported Source IntoCorp Connectability

SINK YOUR

Introducing WordStar* 2000 Plus Release 2, the new and improved software that topoed InfoCorp's chart of word processing packages. DisplayWrite® 3, International Data Corporation's Jim Chapman concluded:

We could make all kinds of claims about our new WordStar 2000 Plus Release 2

About its commonsense commands, Tutorials for easy training. Direct Lotus* file input Extensive printer support, OCA connectivity, LANs and site licensing options.

That would be easy to do.

But we decided to let the experts do the talking. In a comparative report—the report containing the chart to the left-Robert Lefkowits of InfoCorp said:



winner in overall applicability. InfoCorp believes WS 2000+ would appeal to the largest number and widest variety of users, its layered functionality. ease of learning, and excellent communications features make it Ideal for corporate users, ranging from secretaries

"WS 2000+ emerges as a clear

to clerks to managers to executives."

And, after reviewing WordStar 2000 Plus Release 2 alongside MultiMate" Advantage" and IBM"'s

"WordStar 2000

is our favorite-for ease of learning, ease of use ... and for well-conceived and helpful documentation."



Now we don't expect you to take these opinions as gospel.

Because when it comes to knowing your company's word processing needs, you're the expert who really matters.

So evaluate our product yourself.

See your local MicroPro dealer today Or call 800-227-6703 (800-632-7979 in California) for the dealer nearest you. Put WordStar 2000 Plus Release 2 to the test and see how it measures up to the advance reviews.

We believe it'll be time well spent. For you and your company.

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WORDSTAR



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Powerful word processi has never been easier."

BOARD 20

BOARD TO

A Hard Drive The Easy Way.

Turn your PC into an XT in seconds with OnBoard, Maynard's new hard drive card!

So your PC needs a hard drive...

When you bought your PC, you never dreamed you'd need more than floppy drive performance. But now, both you and your PC are ready for more. In fact, there's just one reason you've been putting off getting a hard drive. Admit it. It's the installation. Cables and controller and all that.

Well, relax. OnBoard is here. The hard drive card that boosts your PC's storage capacity to rival any XT or AT' on the block! OnBoard snaps easily into one of your IBM PC's expansion solist! Open your PC, plug in OnBoard, and close your PC. Just like that. Your PC will boot directly to OnBoard when you power up — no more floppy disk maneuvering.

Powerful Self-Control.

If you already have a hard drive in your PC, OnBoard's controller card will double up and run both hard drives. Which helps keep your expansion slots open for other business.

Lots of Head Room.

Lots of Desk Room.

OnBoard puts up to 20MB of power into your PC, turning it into a hard drive heavyweight in seconds! If you need less storage but the same speed and fine performance, you can install OnBoard 10.



Single-Slot Installation.

Simply snap OnBoard into expansion slot 1 of your IBM PC* or XT, leaving all your other slots free for additional boards

OnBoard is designed to work in today's leading PCs and is available at the finest computer stores. Contact your local dealer or call us today for more information.

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RST LOOK: PC CONVERTIBLE	
MHZ IBM PC AT	

IBM Laptop Dignifies The DOS-to-Go Market

PC FIRST LOOK

Big Blue hopes DOS compatibility stretches to include 31/2-inch, 720Kbyte disk drives.

BY BILL HOWARD

NEW YORK-What weighs 13 pounds, boasts a dual personality (or suffers from schizophrenia), and just killed off its brother the PC Portable?

Meet IBM's better-late-thannever PC Convertible, alias Clamshell, the almost-IRS-laptop that is roughly the eighth entry in the 15-pound, batterypowered, DOS-on-a-handle genre. IBM introduced the Convertible April 2, along with more powerful and cheaper ATs and XTs and upgraded 3270 PCs (nage 38).

IBM wants you to think of its \$1,995 laptop as a go-anywhere portable that can be converted to desktop use by tugging off the 80 by 25 LCD screen and snapping on a \$325 display adapter at the rear of the system unit, with a composite monochrome

(\$180) or color (\$400) display on top. To believe it's a true desktop machine, you'll have to imagine yourself satisfied with no numeric keypad and half the The box is bigger than you

might expect if you've seen a Toshiba or Kaypro laptop, It measures 12 by 14 by 21/4 inches, and a road-ready unit with a

15-character-per-second thermal printer and serial/parallel ports docked on the back surpasses 20 inches. Inside, there's room for only 512K bytes of CMOS RAM on four 128K drop-in modules. A carrying handle is provided, more for

IBM's PC Convertible is \$1.995 with 256K bytes of RAM, an LCD screen, and a pair of 31/2-inch drives. Plan to hand the dealer as much as \$4,020 for a complese system

show than comfort. Construction quality is good, a plus in a market segment where quality control isn't always the highest

priority. Plan to spend at least (continues on next page)

Copy Protection Losing Its Favor

89 ANALYSIS

Microsoft and Software Publishing unlock their software. Of the top

ten, now only Lotus and Ashton-Tate are holdouts.

BY STEWART ALSOP AND CHARLES BERMANT

The PC software industry is going bare. It isn't gathering on a nude beach. Rather, more and more software companies are removing copy protection from their major products. Microsoft Corp. quietly

dropped copy protection from Access, Project, Multiplan, and Microsoft Chart over the last 6 months and just recently from its only remaining protected PC-DOS program, Microsoft Word (see "Microsoft Word 3.0 Gets Better in Most Every Way," page 52). Software Publishing Corp. says it will drop copy protection from all future

new products in its PFS and Harvard software lines. "It's an ease-of-use issue," says Kim Domino, spokesperson for Software Publishing. "Corporations have requested removal of copy protection, not to violate the law but to make backup (continued on page 42)



IBM Laptop

\$3,000 for a seriously equipped

31/2-Inch Drives

IBM is banking on the marketplace expanding its definition of PC compatibility to encompass the 720K-byte, 3½-inch micro-floppy-disk drives. They're better in every way but one: 5 million-plus MS-DOS and PC-DOS machines use 5½-inch floopies.

IBM expects data transfers between Convertibles and desktop machines to be done with the 3½-inch disks at the desktop machines. Three 3½-inch drives were announced for desktop PCs. no 5½-inch drives are planned for the Convertible. One possibility: IBM is herding the marketplace toward 3½drives on PCs. What's good for IBM is send for America.

Why an LCD?

In the tug-of-war between battery life and display quality, IBM went for battery life. The display epitomizes both the pinnacle of LCD technology and mediocrity. IBM says the contrast ratio is 3:1; most other LCDs are around 2:1. Readability is enhanced by the standard IBM-designed character set, though the character spacing is a bit wide. The made-for-IBM LCD gives 6 to 10 hours of life from its internal rechargeable hattery nack compared with 2 to 3 hours for internally illuminated LCD displays. Alternatively, for desktop readability, you have the \$505 monochrome or \$725 color display options.

Most (not all) users will cheer the 78-key keyboard. It's clicky but less so than on the PC and XT. Resistance is good; critics will say it's too high. It's

Laptop MS-DOS Portables

Company & model name	Disk drives	Dimensions	Wt. (ibs.)	List price	Notes
IBM PC Convertible	(2) 31/2	14¾×12½×2%	12.2	\$2,190	\$1,995 without serial/ parallel ports.
Quadram Datavue	(1) 51/4	12%×6%×10%	12	\$1,695	Backlit fluorescent screen, \$1,995 Gaslit screen, 768K RAM, \$2,495
Quadram Datavus	(2) 31/2	124×64×10½	14	\$2,095	Backlit fluorescent screen \$1,995. Gaslit screen, 20Mbyte hard disk, \$3,495.
GRIDCase2	(1) 31/2	14×111/2×21/4	12	\$3,150	128K RAM (512K, add \$400).
Data General/One	(2) 31/2	1314×1114×214	8.8	\$3,495	
Morrow Pivot II	(2) 31/2	13×5%×9%	14	\$1,995	10Mbyte hard disk, 320K RAM, \$3,115.
HP Portable PLUS	None	13×10×3	10	\$2,695	Serial port only.
Toshiba T1100	(1) 31/2	12×12×21⁄2	9	\$1,999	External 51/4-inch drive \$529.
Kaypro 2000	(1) 31/2	111/2×13×21/2	11.5	\$1,995	Serial only. Parallel adapter, \$65.
Zenith Z-171	(2) 51/4	13×5%×9½	14.5	\$2,399	Backit LCD.
Sharp 7000	(2) 51/4	16×8½×6½	19	\$1,795	Backlit LCD, 320K RAN

Except where noted, systems have 80 × 25 LCD acreens, 256K-byte RAM, paralleliserial ports, two disk drives. All rum MS-DOS or PC-DOS.

based on the layout introduced with the RTP G and now included on new ATs and ATs: function keys along the top, a separate cursor-control pad, and a control key in the lower-left-spacing of full-size IBMs. Concessions to the 12-inch system width: no separate Home. End. PgUp, and PgD kn keys; no americ pad (they're shared with other keys and accessed with a PC/p-style function key); and dinky function key); and dinky function key); and

The Speed of a PC The Convertible with a pow-

er-saving 80C88,CMOS version of the 8088 processor appeared up to 5 percent faster—with screen updates up to 20 percent

faster—than a standard monochrome IBM PC. It won't blow ne away the AT or turbo-board PCs, but the Convertible more than holds its own against stock

> Both rate 1.0 on The Norton Utilities Syslin6 test. PC Magazine Labs write, random-read, and sequential-read benchmark tests showed the Convertible's microfloppies to be faster than the PC's 5½-inch drives in the

four write and sequential-read tests, slower in the 512-byte random-read test, and tied in the 578-byte random-read test. There's a brief but somewhat maddening hesitation between the time when you hit the Enter key and when the drive spirs,

In the PC Labs' 1-2-3 benchmark test (for screen updating and processor speed), the Convertible took 237 seconds with

File transfers between the PC Convertible and a desktop PC are done by a \$395 external 3%-inch drive, below. No 5%-inch drive is available for the PC Convertible.

though

PC Magazine Labs benchmark tests showed the Convertible's microfloppies to be faster than the PC's 5¼-inch drives in the write and sequential-read tests.





the Color Display driver, versus 233 seconds for a color PC. The Convertible doesn't require retrace checks for writing to the screen, so the speed can be improved slightly by patching out those checks in the driver. J When J-23 pic charts were called to the screen, they more closely resembled watermelon charts because of the horizontal aspect ratio.

IBM's SideKick

Included with the machine is Application Selector, a menudriven program shell with seven DOS commands and System-Apps, which is best described as IBM's answer to SideKick: Notewriter (bare-bones DisplayWrite), Schedule, Phone List, and Calculate, IBM rigged SystemApps so it can't be used on desktop PCs.

Software Tests

PC Labs tested several of the leading software packages on the Convertible. All ran: Microsoft Word (Version 3.0), Word-Star (Version 3.3), XyMrid, and 1-2-3. The Convertible seems to handle the LCD interpretation of color graphics better than the Toshiba T1100, which rendered some of them

black on black.

Don't count on everything running so easily, however.

Programs that bypass the BIOS and write directly to hardware, along with graphics programs, could have trouble.

Software publishers are quickly supporting the 3½-inch

IBM PC Portable, R.I.P.: 1984-1986

Except at Harvard, where it had a strong following among America's fature MBAs, the PC Portable never sold well. On April 2, IBM put the machine out of its misory.



NEW YORK—What can you say about the PC Portable, a \$2,250 machine (256K bytes of RAM and two floppy disk drives) that was outmarketed, outsold, and outperformed by the Compaq portables? How about good-bye? With the emergence of the PC Convertible, IBM made it clear

it believed its 30-pound Compaq clone had little or no future.

Or, as Entry Systems Division president William C. Lowe said April 2—in classic IBMspeak—"It was withdrawn from active marketing today."

—Bill Howard

format (see PC Update, page 44). Some of the stuffier ones want you to buy one copy for your desktop PC and one for your laptop.

Among the clip-to-the-back modules is a 3½-pound thermal printer. It's cheap (\$295), finicky about the paper it's fed, and slow—40 characters per second claimed but rated 15 cps in PC Labs' speed test.

Inside, 1BM offers a \$450, , 200-bit-per-second modem with the 1BM command set, neatly thumbing its nose at everyone who thought the Hayes command set was more than adequate for communications.

What IBM Didn't Do Aftermarket firms should

Aftermarket firms should have a field day with the Convertible. While there's not much real estate left inside, a

> Aftermarket firms should have a field day with the Convertible.

72-pin I/O connector sticks out the back. Some possibilities: a 574-inch floppy disk drive, higher-density low-power posed 512K-byle limit, a faster and better printer, a Hayescompatible internal modern, a 20-megabyte hard disk, and perhaps and lai-none card comprings and properties of the comperties of the competition of the comperties of the competition of the comton can be competitive to the competitive to the comton can be competitive to the competitive to the comton can be competitive to the competitive to the comton can be competitive to the competitive to the comton can be competitive to the competitive to the comton can be competitive to the competitive to the comton can be competitive to the competitive to the comton can be competitive to the competitive to the comton can be competitive to the competitive to the competitive to the comton can be competitive to the co

IBM's success in the highly competitive I appropriate ble market is by no means guaranteed. The 34'-inch disks are one reason. The second is that the market, while not new, needs to prove itself legitimate. IBM is banking that there's room for hundreds of thousands of general content of the second in the seco

nated display.

College students may want to type term papers under shaded oak trees and reporters may want to cover stories anywhere, but the business of American companies doesn't take place very far from a 10-volt outlet. IBM has its work cut out. The most likely market is businesspeople who now consider a Compaq too heavy and bulky to take on a business tirp or a sales-



PC Convertible IBM Entry Systems Division P.O. Box 1328 Boca Raton, FL 33432

(800) 447-4700 List Price: With 256K RAM, AC adapter, Application Selector, SystemApps, \$1,995; DOS 3.2, \$95; 128K RAM upgrades

(maximum; two), \$195; 3001 (200-bps internal modem, \$450, serial/parallel module, \$195; battery charger, \$25; natio power adapter, \$25; 15-eps printer module, \$295; printer cable, \$45; CRT display adapter module, \$327; 9-inch com-

cance, 3-97, CFF dispipal anaper er module, 3-325, 9-inch composite monochrome monitor, \$400; 33/-inch external drive for PC, XT, or AT (separate models), \$395; 3/-inch internal drive for new PC-XT, \$190; hardware guide, \$50; technical nanual, \$75; service manual, \$150; carrying cases, \$44 and \$44

In Short: IBM's belated and well-built 13-pound entry dignifies the "DOS to travel" market, with speed equal to a desktop PC. The 80 by 25 LCD screen is about as good as today's technology gets. Most us-

ers will like the keyboard. Disappointments: \$12K RAM limit, serial/parallel/video connections are clip-on modules, a Mickey Mouse printer, and non-Hayes-compatible modern options. Only the market can determine if "IBM

compatibility" stretches to include 31/2-inch drives.

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At Last, IBM Sanctions Faster (8-MHz) PC AT

BY JOHN DICKINSON

Across-the-hoard price cuts revealed along with keyboard,

TopView, and XT enhancements

NEW YORK-It was almost as if Ronald Reagan were on national television lifting the speed limit to 85 miles per hour. "The new AT will run at 8 MHz," says Bill Lowe, IBM's Entry Systems Division president, "yet maintain compatibility with all existing applica-

The same man, you'll recall, recently promoted the idea that ATs shouldn't be run so fast. When asked about what he said previously, he replied, "No, I said we hadn't tested them at that speed-now we have.

There's really more to it than that, according to a technical spokesperson from the AT group in Boca Raton, Fla. "We found one area in the BIOS disk

but nonzero, chance of disk errors occurring at faster speeds." he says. "The new AT fixes that and also includes an 80286 chip certified by Intel to run at 8 MHz. The old one was rated at only 6. And," he adds as he lifts the hood off one in a back room at IBM's New York headquarters, "we're using new memory chips that are fast enough with-

out generating excessive heat." IBM also announced an XT with a 20-megabyte hard disk and half-height disk drives. It's the same old box, now configured like any PC dealer worth his salt would set it up for a cus-

101-Key Keyboard If you're ready for it, IBM

announced that the so-called Enhanced PC and AT keyboard (that is, the PC RT keyboard) is now the IBM standard keyboard across all product lines and will be used as widely as possible in the interest of compatibility. You can buy any model XT or AT with either a standard (83/84-key layout) or Enhanced (101-key layout) PC keyboard for the same price, but they cannot be retrofitted to existing models, according to an IBM spokesperson.

Hardware Prices Reduced IBM's array of hardware an-

nouncements was coordinated with across-the-board price cuts that reduce the size of the premium that buyers of genuine IBM products must pay. It's widely believed that the price cuts are belated responses to competitive market pressures. For floppy-only units, the reductions are minor. With hard disks, the reductions are more substantial: \$1,000 for the XT and \$700 for

the AT. The oddest fact about

the new pricing is that the 8-MHz AT is the same price as the 6-MHz model it will presumably replace when inventories run out; the same holds true for the old 10-megabyte and the new 20-megabyte XTs. The only truly aggressive price announced was the PC Convertible's \$1,995 tag.

Upgrade for TopView

IBM's latest answer to the 640K-byte memory limit is to enhance its year-old TopView program so that it swaps inactive programs out of memory and onto disk (including RAMdisks). This means you can have five or six programs running even if their total memory requirement exceeds 640K. Top-View, Version 1.10, priced at \$175, also supports (at last) batch program operation.



IBM's 101-key keyboard is a no-cost option (to the current 83/84 key units) on new PC-XTs and ATs, with a separate cursor pud and 12 function keys across the top. IBM contends it can't be retrofitted to existing PCs. The most dubious improvement is the placement of the control key way, way down in the lower-left-hand corner,

3270 Emulation Programs Boost PC Connectivity

BY JOHN DICKINSON

NEW YORK-IBM's continuing commitment to connectivity between its micros, mainframes, and minicomputers took another evolutionary step with a spate of communications software and hardware an-

Probably the most significant announcements are of new editions of the PC 3270 Emulation Program (Version 2) and the IBM 3270 PC Control Program (Version 3). These new programs allow the PC or the PC 3270 running them to become a "gateway" from an IBM local machines running it to use

the LAN can communicate with the host by using the single gate-

LANs and TopView A new version of IBM Local Area Network software allows

and new software development tools allow greater capabilities for integrating PC 3270s with host applications

product was also announced),

A new bardware enhancement for the PC 3270, the Expanded Memory Adapter, which is a full-length card containing I-megabyte of memory, allows it to use IBM's own version of expanded memory. Up to 2 megabytes of RAM can be accessed using the 3270 PC Control Program, Version 3, and it allows a larger number of local and host-based tasks to run on IBM's hybrid-terminal PC. A new edition of the 3270 carries the same enhancements found on the new PC-XTs announced at the same time.

These new programs allow the PC or the PC 3270 running them to become a "gateway" from an IBM local area network (Token Ring or PC Network) into a host mainframe network.

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Copy Protection (continued from page 33)

Two Holdouts in Top Ten The moves to drop copy protection by Microsoft and Software Publishing leave just two of the top ten business-software publishers-Lotus Development Corp. and Ashton-Tate-selling copy-protected software. And while Lotus says

Uncle Sam's Marching Orders: No Copy Protection at DoD

The four Air Force/Navy microcomputer contracts for a total of 150,000 PCs recently awarded to Zenith Data Systems include many different kinds of software, but

not Lotus's 1-2-3 Lotus certainly makes sales to the government, but it didn't have a chance at these contracts because of its rigid copy-protection policy. Air Force officials met with Lotus; despite assurances of tight control, the copy lock stayed on and I-2-3 locked itself out-to the good fortune of Sorcim IUS, the makers of Super-

Calc The Department of Defense (DoD) lays a tough software copying policy on its people. Individual managers are held responsible and copying is a frequent inspection item. DoD policy derives from the main job of the military services: to be ready for war. PCs are used for everything from programming the ECM (electronic countermeasure) pods on strike aircraft to controlling bunk spaces. If a machine with a copy-protected program installed on a hard disk goes down, there may not be time to send for another original diskette. To Uncle Sam, the need to create operable backups of programs is as intrinsic as the need to make copies of maps and intelligence photos. Until Lotus unlocks, it won't go

to war.

it doesn't plan to change its position in copy protection anytime soon, Ashton-Tate admits to rethinking its position. Ashton-Tate got on the map selling dBASE II (never protected), now sells the unprotected Multi-Mate word processors (acquired when it bought Multimate International), and is seriously considering removing copy protection from Framework II to test how sales revenues would be affected

Beyond the top ten, some other companies use copy protection selectively. Living Videotext of Mountain View. Calif., for example, still protects its ThinkTank outlining program but offers customers a \$40 unlocking program and plans to remove protection with the next major upgrade.

Corporate Clout

What happened to copy protection? In a word, corporations. While individual and small-business users have been complaining about copy-protected programs ever since personal computers came on the market, they lacked the clout to persuade publishers that going hare was in everyone's best interests. Corporations, on the other hand, are now estimated to buy as much as 40 percent of the business software sold. They buy in volumes of hundreds of copies at a time. And they don't like to hassle with copy-protection schemes, particularly with the advent of hard disks and networks. Protected software installed on a hard disk often can't be used after a rou-

tine tape backup. Along with pressure from big corporate customers, publishers are also beginning to believe users understand the legal issues involved. "More people realize that it's not right to copy software and give it to someone else," says Signe Ostby, product marketing manager for Software Publishing. "People understand what is piracy and what isn't. They want to be legal." (They also want to be employed; many corporations have strong penalties for copying

software.) It is customer pressure, then, that is bringing copy protection

to its knees. "Copy protection will soon be one of those things like CP/M, where newcomers will wonder what you're talking about," says Gordon Eubanks, chairman of Symantec Corp. in Cupertino, Calif., which publishes the unprotected Q&A database and word processor-the hottest of last fall's three major software releases. Sales have been less impressive for the other two, Paradox (protected, then unprotected in Version

1.1) and Javelin (protected).

Indeed, Michael Brown, founder and president of Central Point Software, is getting ready to move his company out of selling software that copies protected programs. Brown says Copy II PC, his company's lead product, is still setting sales records (see sidebar " 'Morals' Clause Costs Michael Brown His Award," page 47). "But the customer base will force software publishers to drop copy protection." Brown says. "Corporate and government accounts will no longer accept it. With increased use of tape backups and networks, it becomes too much of an inconve-

nience." Copy protection won't die overnight. The two largest sellers of PC applications are still committed, for now, to protecting their products. Through a spokesperson, Lotus says that it is studying the issue carefully but has no plans to remove copy protection from its products in the near future.

Ashton-Tate's Experiment Ashton-Tate, on the other hand, says that copy protection is the number-one issue for its corporate customers. "It corresponds to the increasing use of hard disks and networks," says the company's president Ed Esher, Ashton-Tate is now considering removing the protection from Framework II, its integrated productivity package, as an experiment. "If our revenues go down, we'll put the protection back," says Esber. "If they stay the same or go up,

we'll take protection off every-

thing.

There are some areas where software publishers continue to feel justified in protecting their products. Joe Diodati, vice president of marketing for Softguard Systems in Santa Clara. Calif., the leading vendor of copy-protection systems (the one used by Ashton-Tate and Lotus) admits copy protection "is probably dying" but maintains that specialized software

still needs to be protected be-(continued on page 44)

Copy Protection: How It Works

Copy-protection schemes are designed to make duplication of program disks difficult or to make copies unusable.

In one scheme, errors are purposely written on disks that the DOS utilities COPY and DISKCOPY automatically correct when making copies. If you attempt to run a copy-protected program from a duplicated disk, the program checks for the intentional errors; it won't run unless it finds them. This is the method Softguard Systems uses for its SUPERLoK protection scheme. 1-2-3 (Release 2), Symphony, Framework, and dBASE III Plus all use this arrangement.

Vault Corp.'s Prolok uses another technique: it creates non duplicatable errors by damaging the disk with a laser. Prolok was rumored to have a "killer worm" that would damage data if illegal copies were made. While untrue, the reports scared both users and makers away from Prolok.

To use older copy-protected software with a hard disk, users had to have a key disk in drive A:. Newer methods, including Softguard's, allow hard disk use by hiding files at certain locations on the disk. Although a step in the right direction, these programs can interfere with normal hard disk backups and cannot themselves be backed up except by so-called image systems which can only restore files to the same (undamaged) physical hard disk

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■ PC UPDATE ■ PAUL M. STAFFORD

IBM's introduction of new PC-XTs and PC ATs April 2 was accompanied by price cuts on existing models. ATs with a 20-megabyte hard disk, 1.2-megabyte floppy, 512K bytes of RAM, and a 6-MHz processor speed were reduced \$900, to \$4,895. The same units with 30-megabyte drives were cut \$700, to \$5,295, an enhanced version with an 8-MHz CPU is offered at the same price. The 6-MHz, 256K RAM AT with a 1.2-megabyte floppy disk drive

remains \$3,995 XTs with 256K RAM, a full-height 360K floppy disk drive, and a 10-megabyte hard disk were reduced \$1,000, to \$2,895-the same price as the new XT with 512K RAM, a half-height floppy disk drive, and a 20-megabyte hard disk drive. XTs with 256K RAM and one or two full- or half-height floopy disk drives are \$2,145 and \$2,295, respectively; the full-height XTs formerly were

\$2,270 and \$2,570. The half-height floopy machines are available with a choice of the standard 83-key or enhanced 101-key keyhoants

IBM PCs with 256K RAM and one and two full-height floppy disk drives are \$1,845 and \$1,995, respectively, down from \$1,995 and \$2,295.

IBM raised the price of its Writing, Filling, and Graphing Assistant programs from \$149 to \$165; Planning Assistant rose from \$129 to \$145. IBM also raised prices on its Personal Decision/Business Management Series, between \$15 and \$80. PC Storyboard increased \$25, to \$275.

Software vendors were quick to support the new 31/2-inch disk format of the PC Convertible. They include: Lotus, Ashton-Tate, Microsoft, Lifetree, MicroPro, Microstuf, Microrim. Satellite Software International, Alpha Software, MECA, Living Videotext, and Computer Associates International. Some vendors are making the switch easy: copy the non-copy-protected software from 51/4-inch format, buy the package in 31/2-inch format, or write for a free update. This group includes Microsoft, Alpha Software, and Micros-

tuf. Upgrade (or "crossgrade") fees are planned by Microrim and SSI, about \$20 to cover the cost of disks and handling. No word from Lotus on prices for its I-2-3 and Symphony crossgrades. Ashton-Tate expects users of dBASE III Plus and Framework II (both

copy protected) to buy the programs a second time. Quadram (Datavue 25), Data General (Data General/One), and Toshiba (T1100) already sell portables that incorporate 31/2-inch disk drives; more than 60 programs are available on 31/2-inch Data General/One disks. Data disks should be completely interchange able between the Quadram, Data General, Toshiba T1100, and IBM machines. According to Data General representatives, "some incompatibilities" might exist between the Data General/One and the PC Convertible, especially in the realm of communications.

Microsoft released Version 1.01 of its Access communications pro gram, with updated menus to support the Official Airline Guide, more efficient hard disk installation, faster operation, and no copy protection. It's free to registered Access owners; \$250 otherwise. For more information contact: Microsoft Corp., 16011 NE 36th Way, Box 97017, Redmond, WA 98073; (800) 426-9400, (206) 882-8080.

IBM'S PC/XT/AT PRICE CUTS Ħ 101-key key \$5,995 \$5,295 12% board, 8-MHz (30-Mbyte hard disk drive, 1.2-Mbyte CPU flongy disk drive. 512K RAM, 84-key keyboard, 6-MHz CPU) 20-Mbyte hard \$3,895 \$2 895 26% PC-XT

disk drive drive, 256K RAM 512K RAM 83-key keyboard) 101-key keypoard \$1.995 13%

(two floppy disk drives, 256K RAM)

(10-Mbyte hard disk

IBM cut prices on most of its personal computer line and introduced enhanced mode on April 2. Some of the enhanced ATs and XTs are priced the same as existing models even though they have markedly superior features and performance.

\$2,295

Copy Protection

(continued from page 42) cause the potential market is so small. Widespread copying of a specialized application could

ruin the developer. Bruce Grant, chief of technical support for Microage Computer Stores in Phoenix, Ariz... agrees. He doesn't believe that copy protection will ever die completely. Instead, he says that new vendors with nichemarket applications should copy-protect them, while publishers of a low-end word processor or spreadsheet shouldn't. (Publishers of entertainment

and educational software also

feel justified in protecting their programs.

Limited Liability David Wagman, chairman of

Softsel, a leading distributor of software, maintains that copy protection is still as sensitive an issue as ever and that it's premature to say it's vanishing. Wagman says vendors have been trying to develop alternative schemes, such as providing corporate customers with unprotected software and an agreement to limit the corporation's liability if the company agrees to enforce copyrights. "It's a double-edged sword," Wagman says. "Copy protection keeps employees from making illegal copies, but then you can't copy the program. With this arrangement a corporation wouldn't be as liable for an employee's actions. But no one has

solved the problem for the home or small business user. Ashton-Tate's Esber disagrees: "The basic issue is the amount of liability a corporation assumes in buying software. Corporations believe that their liability is reduced if they buy unprotected software or get an unlimited right to make copies. The truth is exactly the reverse,

since that puts the burden on

The death of copy protection

them to enforce the law."

Borland turned unprotected programs into a marketing advantage by selling the unprotected version of SideKick for \$30 more than the protected version. The success of the more-expensive, unprotected version demonstrated that it is possible to

really began in 1983, with the

arrival of Borland International.

build a healthy and profitable business selling software that's unprotected.

Do users appreciate unprotected programs? "My mail has a night and day difference, says Living Videotext president Dave Winer. "I haven't gotten a single nasty letter since we unprotected ThinkTank."

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- POINT-AND-CLICK SHELL for Lotus 1-2-3: No more jerky cursor movement, no more delays, no more beeping. To select a cell, execute a command, scroll your spreadsheet, or call up context sensitive pop-up menus, just point with the mouse and click!
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Working Around Copy Protection

M PRODUCT REVIEW

BY WINN L. ROSCH

While software companies would have you believe that the choice of keeping or abolishing copy protection is theirs, programs costing as little as \$40 effectively let you make the decision. These products help you cope with copy protection in three different ways:

- Some climinate the need to keep an original, or key, disk in floppy disk drive A: when you have the bulk of the applications program you want to use loaded on your hard disk.
- on your hard disk.

 Others let you back up the distribution disks. You haven't removed copy protection, but you have extra insurance against disaster. And, if each

"Morals" Clause Costs Central Point Software's Michael Brown His Award

Central Point Software's Michael Brown arrived at the Software Publishers Association convention last fall expecting to receive "gold" certification for Copy II PC/Mac. The fledgling association was recognizing programs selling 50,000 and 100.000 copies, much like the music industry's gold and olatinum records. But at the last minute Brown was told, "No award," even though his program met the sales criteria

"It was out and out censorship," Brown says. "It was supposed to be based on



Michael Brown saw red when his Copy II PC/Mac program went spile—and then got anabbed by the Software Publishers Association.

sales—but they changed the criteria. It was like the RIAA (Recording Industry Association of America) refusing platinum status on a record because they didn't like the lyries."

Notice of the control of the control

Association bylaws state that "as additional issues arise, the association will resolve them in such a manner....to insure that the value of the awards is not diminished." With a gift loophole staring them in the face, association directors unanimously rejected Brown's application.

Brown's application.

Brown says tempers have cooled since last fall, and he's applied for renewal of his SPA membership. That, too, is subject to approval by the association's board of

directors.

—Charles Berman.

disk allows a hard disk installation (often just one or two installations), you then have additional installations available.

 Some remove copy protection so that formerly protected programs can be used and backed up like an unprotected program, or transferred to the 3½-inch format of the new IBM PC Convertible.

Of the products tested by PC Magazine Labs—HardRanner, ZeroDisk, CopyWrite, Disk Mechanic, UNlock, and the Copy II PC Option Board—all were effective at doing what they promised.

HardRunner, ZeroDisk

Nostradamus's Harafkanner and Quaid Software's ZeroDist take the first approach, climinating the need for key disks. Both programs are run, perhaps as part of your AUTOEXEC-BAT file, and become memory resident. Each milmics the response the key disk makes to the copy-protected program by intercepting the BIOS request for disk access (Interrupt 13H) and reporting back that the key disk is in drive A:

reporting stack mat the key disk is in drive A.:

HardRanner (\$49.95) is narrowly targeted. It works only with \$i + 2 \) (Releases 1A and 2),
\$5 mp/hony, and copy protected versions of SideKick. When installed in its most economical control in the stalled in its most economical control in the side of the side of

hard-disk installations. ZeroDisk (\$75) is a moregeneral-purpose product that requires 15K bytes of RAM and allows you to copy 1-2-3 (Releases 1A and 2), Symphony, dBASE III, Framework, R:base 4000, Spotlight, Clipper, Managing Your Money. Double-DOS. SPSS/PC+, Electric Desk, Enable, ProKey 3.0. Clout, smARTWORK, Concentric Information Processor. Harvard Project Manager, Harvard Total Project Manager, ThinkTank and Microsoft Word (pre-3.0) without worrying about a key disk.

Copying the Uncopyable
A second group of programs



COPT II PC, Version 3.65 Central Point Software Inc. 9700 SW Capitol Hwy., #100 Portland, OR 97219 (503) 244-5782 Liet Price: \$39.95; updates, \$15 plus \$3 shipping.

\$15 plus \$3 shipping.
Requires: 64K RAM (256K on PC)r and Tandy 1000), one disk drive.
In Short: Bit-linage disk copier that works like DISKCOPY.

only bester, Will duplicate most copy-protected disks. Easy to use. Includes NOKEY, a memory-resident utility that allows some programs to run without a key disk in drive A:. Not copy protected.

CopyWrite
ZeroDisk
Quaid Software Ltd.
45 Charles St. E., 3rd Floor
Toronto, Ontario

Canada M4Y 1S2 (416) 961-8243 Last Price: CopyWrise, \$50 (U.S.); ZeroDisk, \$75 (U.S.)

(U.S.); ZeroDisk, \$75 (U.S.) Requires: CopyWrite: 128K RAM, DOS 2.0 or later; Zero Disk: 15K RAM in excess of other memory requirements; DOS 2.0 or later.

In Short: CopyWrite makes bit image copies of disks and thus copies copy-protected disks. Easy to use. ServoDisk in a neem ony-resident program that removes the key disk requirement for 1-2-3 (1A and 2), Sympho-year, dBASE III. Framework.

R-base 4000, Spotlight, Clipper, Managing Your Money, DoubleDOS, SPSSIPC+, Electric Desk, Enable, ProKey 3.0, Clout, smARTWORK, Concentric Information Processor, Harvard Project Manager.

Harvard Total Project Manager, ThinkTank, and Microsoft Word. Both include UN-GUARD, which removes Softguard's copy protection.

allows you to copy the supposedly uncopyable disks by ignoring dirty tricks like invalid sec-(continued on page 51)

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Copy Protection

tors and bad clusters that many copy-protection schemes use. Rather than correct such intentional disk errors (as the DOS COPY utility would), these programs duplicate each bit exactly with it found on the disk

as it is found on the disk.

COPY II PC (\$39.95) is

probably the easies of such programs to use. Running it is no

more difficult than using DISK
COPY. In fact, you may just

want to substitute it. COPY II

PC takes longer to duplicate a

disk than DISK COPY because

it checks its work as it goes

along and will let you know if a

tareer disk has bad sectors.

target disk has bad sectors. CopyWrite (\$50) works from a menu that lets you choose between several options that optimize the protected disk copying process. The menu gives Copy-Write a bit more flexibility than COPY IP PC, and for some users COPY in the may be easier to op-

crate. Disk Mechanic (\$70) gives you complete control over your PC's floppy disk drives. You can have peccise control over the formatting and copying of the whole disk—down to an individual track. You can even create your own forms of copy protection, if you are into such things. But it's not easy to use: a hacker would be more comfortable with Disk Mechanic than a copporate user would be.

corporate user would be.

Any of this threesome will help you duplicate nearly any disk that could be written with the PC's floppy disk controller. All three are updated periodically (usually monthly) so that their copying abilities keep pace with the protection attempts of other companies.

The third category of software removes copy protection from an application. Disk Mechanic, CopyWrite, and Zero-Disk all include a program, called UNGUARD and written by Robert T. McQuaid of Quaid Software, that removes Softguard's copy protection.

guard's copy protection.
TranSec's UNiock series
(\$49.95) consists of three packages, each able to unprotect seven programs, and a fourth package (\$74.95) that amounts to the
"best of" the other three. Athough UNGUARD requires
DOS knowledge and skill to use
the software effectively with
some programs, the UNiock series has a fully prompted, stepby-step procedure that's easy to

The Do-It-All Board

No software-only product
can guarantee to deal with all
copy-protection methods. Copy
If PC and CopyWrite, for instance, could not deal with Jav-

II PC and CopyWrite, for instance, could not deal with Ianelin. All are limited by the flopyd disk controller in their ability to write to the disk. Copy-protected originals can be created on sophisticated machines that write sectors and other disk information in ways that cannot be duplicated by the PC floppy disk controller.

A hardware-and-software combination developed by Central Point Software, the COPY II PC Option Board (\$95), avoids the limitations of the PC disk controller. Once the Option Board is installed, a PC or compatible can duplicate almost any disk; PC Labs could not find a program this board couldn't handle.

Which product works best? Because copy protection can interfere with the ability to back up a hard disk, business-oriented users may prefer programs like TranSec's UNlock series. For ease of use, it's Copy II PC or CopyWrite over the less-refined Disk Mechanic. ZeroDisk is best for eliminating the key

disk requirement: if you use only 1-2-3 or Symphony, HardRunner is fine. And the Copy II PC Option Board is genuinely heavy artillery—not often necessary but unbeatable when called into action.



FACT FILE

Disk Mechanic, Version 5.3 MLI Microsystem P.O. Box 825 Framingham, MA 01701 (617) 926-2055 List Price: \$70, plus \$3 ship-Requires: 192K RAM under DOS 1.1, 2.0, and 3.0 (256K on Compaq); 64K more RAM if used with only one floppy disk In Short: A DOS-independent program that allows duplication of nonstandard disks, including many that are copy protected. Allows intimate control of nearly all aspects of system disk drive function. Includes UN-GUARD. Also has some Norton Unifines-like features, including file recovery. Hackerlike in terface; not as easy to use as the

others. Not copy protected. CIRCLE 661 ON READER SERVICE CARD HardRunner Nostradamus Inc 5320 S. 900 E., #110 Salt Lake City, UT 84117 (801) 261-0769 List Price: \$49.95 Requires: Any system that can run 1-2-3 or Symphony. In Short: A memory-resident program that requires less than IK RAM and allows 1-2-3 (1A or 2.0), Symphony, and copy protected SideKick to run with out a key disk in drive A:. Good choice if your memory is limited and your only protected programs are from Lotus. Conv

protected.
GROLE 600 ON READER SERVICE CARD

UNlock, Version 4.9 Transe: Systems Inc. 1802 N. University Dr., #200 Plantation, Fl. 33322 (305) 474-7548 List Price: Album A, B, or C, \$49.95; Album D, \$74.95; updates for A, B, and C, \$25 ench; D, \$37.50. Requires: IBM PC, AT, or compatible, MS-DOS 2.1 or lat-

compatible, MS-DOS 2.1 or later. (Each puckage may impose specific memory requirements.) In Short: Album A will unprotect 1-2-3 (1A and 2.0), dBASE III and dBASE III Plus, Framework I and II, System (1.3 and 2.0), Spotlight (1.0 and 1.1), Graphwriter (4.3 and 4.3i), and Realia COBOL (1.2 and 2.0). Album B unprotects Symphony 1.1, Clipper (Winter 84 and Summer 85), Managing Your Money (1.5, 1.51, 2.0), DoubleDOS, Electric Desk (1.04), smARTWORK (1.0 revisions 8, 9, and 10) and Data Base Man-

ager II (2.0, 2.02). Album C unprotects Microsoft Word (1.15, 2.0, 2.01). Multilink Adsunced (3.02), IBM Writing Assistant (1.01), 1-2-3 Report Writer, Parados (1.0), PFS-Access (1984 edition), and Think-Tank (2.0). Album D consists of the best of the above.

Copy II PC Option Board Central Point Software Inc. 9700 SW Capitol Havy., #100 Portland, OR 97219 (503) 244-5782 List Prices 905 Requires: One disk drive, one full-length expansion slot. In Short: A hardware add-on that allows PCs toccopy disks using formats beyond the capabilities of the PC's own floopy disk for the PC's own floopy disks that the point of the PC's own floopy disks that the point of the PC's own floopy disks that the point of the PC's own floopy disks

drive controller. Will duplicate nearly all software. Duplicates software (including Javelin) ome software-based programs can't handle, The most expensive and the most wern side.

CINCLE 485 CH WEADER SURVICE CAPIT.

Why We're Writing on Copy Protection

Knowledge in the wrong hands can be dangerous. In writing about products that neutralize copy protection, PC Magazine helps both the businessperson who doesn't want to be bothered by key disks or limitations on hard disk backup and the individual who merely wants to rip off software.

We believe the vast majority of PC Magazine's readers are housest. Not writing about this topic won't make the thieves go away.

Copy protection is a lock on software. And locks mostly keep out honest people.

—Bill Howard

R FIRST LOOK

BY JOHN DICKINSON

The third-annual release of Micrasoft Word—Version 3.0 of the newly public company's popular word processing program—delivers a tasty menu of new features for the professional power user and some appetizers that should interest corporate word processing departrate word processing depart-

Key features for the professional user (typically writers, academics, analysts, and executive secretaries) are automatic generation of indexes and tables of contents and a built-in outline processor. For corporate users (clerically staffed word processing departments, where appearance is crucial). Word 3.0 offers enhanced laser printer support. wide-ranging network support, and an improved on-screen tutorial that can be optionally run from Word 3.0's context-sensitive belp facility.

Gone from Word 3.0 is copy protection, which caused older versions to start slowly. This version is a rocket ship by comparison. The list price was hikef 555 to 5450, but Microsoft officials expect that the street price (as low as \$225 to \$250 will not change. Upgrades are \$75.

Faster Scrolling

Word 3.0 is also considerably faster than previous editions

Word 3.0's index and table of contents

capabilities are easy to use, flexible, and

reasonably fast. Both are tied to a new



Microsoft Word, Version 3.0, offers 43-line support for users. Outline documents can be viewed in normal (left) or outline (right) mode, and multiline headings can be freely mixed with text, it costs 5450 and is no longer copy protected.

fessional programs such as WardPerfect, WordStar Professianal, and Volkswriter and is faster than most corporate-style word processors, such as Multi-

Mate.

The outline processor built into Word 3.0 is a direct descendent of Tabila Tunal from Living dent of Tabila Tunal from Living of the Tabila Tunal from Living the control keys used to expand and contract outlines. What they won't recognize is the easy inclusion of lext entries under headings, multiple-line heading entries, and the flexible formatting Word allows—including Word style sheets, which have been enhanced to outline work. The outline can be continued to the continue work. The outline can be

numbering styles; ordinary text paragraphs can be numbered as well.

Easy Document Indexing Ward 3.0's index and table

of contents capabilities are easy to use, flexible, and reasonably fast. Words or phrases to be indexed or put into a table of contents are marked with special characters formatted as hidden text. You can build your own glossary entries if you use them frequently (it's surprising that Microsoft didn't build them in). The tables are built by running a program (through Word's Library Run command) that places the index or table of contents at the end of the document. The program can be run again to modify or replace the tables whenever you make significant changes to the document, and pages can be numbered so that the table of contents can be placed at the front of the document after it is printed (you can also physically move it there

when the document is complete, but there is no real need to). Both the index and table of contents capabilities are tied to a new hidden text format that is also useful for hurving commentary material or other text you want to temporarily delete from a document. Unlike most hidden text implementations, that of Word 30 works on even a single character, where some other word processors can hide only a paragraph or other large text unit. Hidden text can be buried totally, marked by a special character, or viewed in its entirety.

Built-in Date Format New to Word 3.0 are little

niceties, such as a built-in date format that can be printed as the file's save date or the current date, paragraph sorting (handy for working on mailting lists), and a five-function calculator (+,-,*/, and %) that works on numbers found in text or in tables that are arranged like a

spreadshect. Word 3,0 also allows tables (or any text) to be moved or formatted as vertical blocks and also includes the ability to align individual text columns at horizontal print positions. These two features make the product much more capable of producing the sort of sales proposals and consulting reports that are difficult to do with most professional word processing products.



FILE

Microsoft Word,
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Requires: 2564 RSM, two
dosk drives, DOS 2.0 or later.
Na boart: Adde to Worf's already excellent document-formarting abilities are "Third."
Tank-style outlining, mutb., a
ready-excellent document-forforfor-femicine celebrator, table
of contents and moke spectramarting, a billion serverible,
a parting, a billion serverible,
a parting, a billion serverible,
a partingserverible, and more printer says
out. Seed is much immoved.

No longer copy protected.

hidden text format.

at scrolling and saving files. It's still not as fast as XyWrite II or used as a Plus (is anything?), but it is correctifive with seealar of Guillace.

expanded to full text formatting or used as a simple topics list and printed in either format. Outlines can fellow several.

. .

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■ NEW ON THE MARKET ■ PAUL M. STAFFORD

The C Gets Deeper: Compiler, Interpreter Introduced

The C programming language gained two implementations with the introduction of a professional interpreter from Lifeboat Associates and an entrylevel compiler from Mark Williams

Lifeboat's RUN/C Professional should be of interest to professional C programmers who want to run different pieces and versions of their code without going through a lengthy compilation process. It features source-level debugging facilities and a WordStar-like editor.

Let's C, from Mark Williams, is a low-cost compiler designed to introduce beginners and programmers in other languages to C. It is a full implementation of the language and features one-step compiling, linking, and assembling and a full-screen editor.

List Price: RUN/C Professional. \$250. Requires: 320K RAM, DOS 2.0 or inter. Lifeboat Associates, 1651 Third Ave., New York, NY 10128; (212) 860-0300.

CIRCLE 648 ON READER SERVICE CARD List Price: Let's C, \$75. Requires: 128K RAM, DOS 2.0 or later. Mark Williams Co., 1430 W. Wrightwood, Chicago, IL 60614;

(312) 472-6659 CIRCLE 647 ON READER SERVICE CARD

Three Graphics Packages Enhance PC Business, Scientific Graphics Capabilities

Packages from Brightbill-Roberts, Stella Systems, and Jandel Scientific aim to out another ar-

row in the PC's graphics quiver. Brightbill-Roberts's Show Partner (marketed by The Marketing Channel) is a memoryresident package featuring slide-show and animation capabilities. It supports the IBM CGA and EGA, as well as Hercules monochrome graphics standards. Show Partner also supports the Lotus/Intel/ Microsoft expanded memory specification, which lets all but 3K bytes of the program reside outside the PC's DOS-recogniz-

able 640K RAM Stella Systems Corp.'s Syon can be used either to create business graphics or to enhance graphs produced by 1-2-3, Multiplan, and other packages. Syon supports the IBM CGA and Tecmar Graphics Master graphics cards, with an EGAcompatible version due to be released in May. The program can display eight colors at a time on the Tecmar card and four colors

in CGA mode Jandel Scientific's Siema-

Plot is designed to create and plot high-quality scientific graphs and charts, including scatter, line, and histogram charts. It features log-log and semilog scales and charts, and one- or two-way standard deviation. Sigma-Plot supports the IBM CGA and plots on Hewlett-Packard and compatible plotters and accepts data from I-2-3, dBASE II and III, and other

List Price: Show Partner, \$149. Requires: 128K RAM, compatible color/graphies card, DOS 2.0 or later. The Marketing Channel. 120 E. Washington, #421,

business programs.

Syracuse, NY 13202: (315) 474-3400

CIRCLE 642 ON READER SERVICE CARD List Price: Syon, \$199. Requires: 256K RAM, DOS 2.0 or later. Stella Systems Corp., 10430 S. de Anza Rivd #185 Cupertino CA 95014; (408) 257-6644.

CIRCLE 641 ON READER SERVICE CARD List Price: Siema-Plot, \$199. Regulres: 256K RAM, DOS 2.0 or later. Jandel Scientific, 2656 Bridgeway, Sausalito, CA 94965; (800) 874-1888: (415) 331-3022

CIRCLE 640 ON READER SERVICE CARD Short Stack Half Card Adds Low-Cost Memory and Fits In PC-XT's Short Slot

Ingram-Eve of National City. Calif., is shipping its \$199 512K-byte memory card. The half-length Short Stack saves space by packing two banks of 256K-bit chips on their sides. (continued on page 56)



Ingram Fue's \$199 Short Stock employe a sideways chit you king technique to squeeze two banks of 256K-byte chips onto a half-length card.

HOT PROSPECT

Okidata's 18-Pin 292/293 Printers Break Price/Performance Barriers

Okidata's Microline 292 and wide-carriage 293 dot matrix printers are fast, quiet, and print highly readable text and Okidata or IBMcompatible graphics in up to 14 colors. Okidata will continue to produce the Micro-

line 192 and 193. The speed and text and graphics features alone make these printers a breakthrough in price/ performance-\$699 for the Microline 292 and \$899 for the wide-carriage 293.

The 290 series is rated at 200 characters per second, the same as IBM's \$549 Proprinter, PC Magazine Lahs speed test clocked the 293 at 123 cps in draft mode, compared with 91 cps for the Proprinter.

Most impressive is the 293's speed in NLO mode. The 290s' dual 9-pin printheads let them print highquality characters in a single





Okidasa's Microline 292/293 primers raduce near-tetter-quality printouts at 81 eps and draft-quality at 123 eps

\$699 Microline 292 and \$899 Microline 293 sapplement, not replace. Okudata's 192/193 9-pon line pass. Okidata rates the 290s at 100 cps in NLQ mode; we

clocked them in at a speedy 81 cps, versus 31 cps for the Proprinter. And the print quality is much better than any 9-pin units

Features include a choice of rear or bottom paper-loading, a full set of print enhancements, and an 8K-byte memory buffer. Okidata also throws in two memoryresident programs: Okifont comes with five typefaces and an option to define your own: Color Screen Print can print a color image of any screen plus change the image's shape, size, and color before printing. The 293 comes with a tractor feed and acoustic cover; both are options on the 292

List Price: Microline 292. \$699 (without interface); Microtine 293, \$899 (without interface): Personality Module (Microline or IBM, parallel or serial), \$110; cut-sheet feeder. \$299: 32K huffer, \$69. Okidata, 532 Fellowship Rd. Mount Laurel, NJ 08054; (800) OKI-DATA, (609) 235-2600. Common 649 CANTE (CONTRACT ANTICIDADE

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New on the Market

intinued from page 54) The card includes a clock/calendar, RAMdisk, print spooler software that can run in Short Stack memory above 640K bytes, and other useful utility programs. The Short Stack is sold with a 2-year warranty.

List Price: \$199. Ingram-Eve Inc., 301 W. 28th St., Suite D. National City, CA 92050; (619) 474-1435. CIRCLE 646 ON READER SERVICE CARD

ProPal Adds Memory Resident Utility to IBM Proprinter Arsenal

IBM Proprinter partisans take note: Dynamic Microprocessor Associates of New York has announced its memory-resident ProPal utility. ProPal lets you set printer features like enhanced printing, letter quality, different line spacing, and different character widths. ProPal also features a typewriter function that outputs lines to the Proprinter after every carriage return, as well as an envelope mode.

List Price: \$25. Requires: 128K RAM, DOS 2.0 or later. Dynamic Microprocessor Associates, 545 Fifth Ave., New York, NY 10017: (800) 645-4441, (800) 632-4441 (in NVI

CIPCLE 645 ONDE 4DED SERVICE C48D Everex Streaming Tape

Unit Weighs In with Low Price, Many Megabytes Fremont, Calif.-based Everex Systems has introduced a streaming tape subsystem that can back up a maximum of 60 megabytes of data on a single 14-inch OIC tape cartridge. The Excel-Stream 60-8 features both file-by-file and mirror-image backup options, as well as automatic tape formatting and automatic read-after-write error checking. Everex claims backup times as fast as .2 minutes per megabyte in mirror-image mode

List Price: 5995. Everex Systems Inc., 47777 Warm Springs Blvd., Fremont, CA 94539; (415) 938-

CIRCLE 844 ON READER SERVICE CARD

Wireless Communications Options introduced by Two Companies

Two companies have introduced innovative ways for PCs to send data to remote sites without relying on wire.

Proteon Inc., maker of the ProNET LAN, connects terminals on its network with microwave links. The microwave link transfers data across up to 10mile distances at a rate of 10 megabits per second and can be used with any wire connections on the network. Each microwave connection includes two microwave dishes, receivers, transmitters, and network conpectors

Equatorial Communications Co. of Mountain View, Calif., offers Private NewsWire, a satelite-based message-delivery system. The system uses Equatorial's C-120 Micro Earth Station, consisting of a receiver, a 2-foot antenna, and cc:MAIL electronic-mail software. One C-120 station per machine is required; stations can be either bought or rented.

List Price: Proteon Microwave Link S6 000 Proteon Inc., 4 Tech Circle Natick MA 01760: (617) 655-3340

CIRCLE 639 ON READER SERVICE CARD

List Price: C-120 Micro Earth Station, \$3,350; cc:MAIL, \$295; transmission fee, \$35 per month per receiving unit. Equatorial Communications Co., 189 N. Bernardo Ave., Mountain View, CA 94043: (415) 969-9500. CIRCLE 638 ON READER SERVICE CARD

IDEAssociates Introduces 1.5- to 4-Megabyte AT

Multifunction Card IDFAssociates of Billerica Mass., makers of PC hard disk and tape drives and other peripherals, has joined the AT multifunction card market race.

The IDEA Supermax/EMS combines up to 4 megabytes of expanded, extended, and conventional RAM with two serial ports and a parallel port. The main card can hold up to 1.5 megabytes of RAM, and a 2.5megabyte daughterboard bringing the card up to a total of 4 megabytes.

The C-120 Micro Earth Station (\$3.350) from Equatorial Communications allows users to transmit electronic mail via catellite



List Price: With 0K RAM, \$495: with 4 Mbytes RAM, \$2,595: IDEAssociates Inc., 35 Dunham Rd., Billerica, MA 01821; (617) 663,6878 CIRCLE 643 ON READER SERVICE CARD

Two Turbo Boards Bring PCs. XTs Up to AT Speed

In a quest to slake PC users' insatiable thirst for speed, two manufacturers have announced turbo cards that boost PCs and XTs to AT-like performance levels

The Dynatec PC Supercharger puts a 10-MHz 8088-1 chip on a slotless circuit board that plugs into the PC's 8088 socket and mounts on the back of the system unit. It features an external switch for situations in which a 4.77-MHz clock speed is required.

MA Systems' Performer-286 combines an 8-MHz Intel 80286 with two banks of 120-nanosecond RAM chips. An additional daughterboard carrying two banks of fast 64K-byte chips

74- 5270 Dynato. PC Superskarger in 1917C

and XT operations up to an 8-MHz clock speed without asing an expansion slot.

brings the system up to a full 640K bytes of high-speed RAM. The card takes up a single expansion slot in the IBM PC or XT.

List Price: Dynatec PC Supercharger, \$279, Dynatec Systems Inc., 870 E. 9400 South. #103-B, Salt Lake City, UT 84070. CIRCLE 637 ON READER SERVICE CARD

List Price: Performer-286, with 512K RAM, \$995; with 640K RAM, \$1,149, MA Systems, 2015 O'Toole Ave., San Jose, CA 95131; (800) 543-6546; (800) 223-3276 (in Calif.). CIRCLE 636 ON READER SERVICE CARD

Storage Board Puts 20-Megabyte Hard Disk on

Estates, Ill

One-and-a-Half Slot Card Another hard disk on a card has appeared: The Storage Board, a 20-megabyte model from Micro Systems Group Inc. of Hoffman

The Storage Board lands center slot in terms of price and performance, clocking in at a 72.5-millisecond average access time on Core International's hard disk test and drawing 15.3 watts directly from your PC's power supply (rather than through the bus). Micro Systems Group also promises a 30megabyte disk/controller in late May.

List Price: \$995. Micro Systems Group Inc., 2117 Stonington, Hoffman Estates, IL 60195; (312) 882-5666 CIRCLE 635 ON READER SERVICE CARD



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Supports 640 × 350 for IBM's Enhanced Color and Monochrome Displays and compatible monitors	~	~
Supports full 16 colors in 640 × 350 on the IBM Enhanced Color Display and compatibles	~	~
Supports full 16 colors in 640 × 200 and 320 × 200 for the IBM Color Display	~	-
Parallel printer port	~	_
Soft scroling, panning and windowing	~	~
Optional Clock/Calendar	~	
Supports a light pen interface	~	~
Includes PC Accelerator", STB's exclusive utility program which provides up to 10 disk emulators, 3 print spoolers and utilizes available system memory, PC/AT memory store one megabyte and EMS memory [Lossa" (Inlet "Microsoft"] through STB's Memory Companion PC" board.		
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SID carries this concept intrough in tom inguity sponsest act about acting ... to in-compromise quality control in every phase of manufacturing ... followed by full functional product testing, continuing through all aspects of documentation and support.

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lates a PC having up to 512K RAM.
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CIRCLE 393 ON READER SERVICE CARD



NEW TECHNOLOGY: THE TOUGHEST SELL



What will it take to get PC users to discard their old monochrome monitors, dBASE II, and 1-2-3 (Version 1A) and take advantage of the latest technology?

Tou there, with the monochrome monitor. Why haven't you upgraded to graphics yet? You can have color, the same text resolution, and graphical output. Besides, if you ever get lonely for monochrome, you can always run it in green on black.

How about you, still running dBASE II? Can't give up your macros inside DO loops? Too lazy to learn something better? Chicken to convert your data files?

Hey spreadsheet jockey! Did you think you'd escape this little tirade? No. you'll just use 1-2-3. Version 1A, until you die. right? Sure, it's good enough, but is good enough, good enough?

CLEAN BREAK It's an age-old guestion: When do you break with the past and start out in a new direction? It depends. Let's look at some specific new technologies and products and how well the marketplace is accepting them.

The installed base of monochrome systems is enormous. But today the swing is clearly toward graphics systems. The Enhanced Graphics Adapter standard has made a tremendous difference in the marketplace: it lets you have your cake and eat it, too. I'm hard pressed to think of a user or situation that wouldn't benefit from an EGA and matching monitor. Some forward-thinking companies have already standardized on the EGA. What will it take to get the rest on the bandwagon? A lower price, for one thing. You can buy a whole MS-DOS computer for IBM's list price on its original EGA and monitor, so it's clearly not for everybody. Today, however, you can pick up one of the EGA imitators and a decent monitor for half that amount.

Your boss will want to know what the payback is. You can point to greater productivity because you reap the benefits of color graphics without sacrificing the readability of the monochrome system. You can make a case for preparedness because Microsoft Windows works best on an EGA, and it will certainly be the operating environment that carries us into the next generation of PC operating systems. You can make a case for technology because you'll be able to use such state-of-the-art word processors as Microsoft Word.

The market leader in word processing commands only 10 percent market share. In databases, however, dBASE still dominates: it probably has over 60 percent of the market. It was first, it's powerful, and it's programmable. But is it the best?

Ashton-Tate has conscientiously upgraded dBASE, keeping it feature-rich and

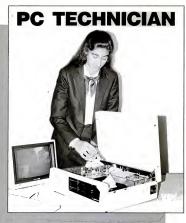


its user community loval. Sure, there are faster products. Yes, there are better solutions for multiuser applications. But the number of embedded systems written in dBASE II and III code is so large that most companies would be foolish to consider converting to another database manager.

R:base 5000 and Paradox are fine, products, but they're up against dBASE III's installed base. I can make a case for either product, and half a dozen others, that would fit some specific new applications better than dBASE. Some old dBASE applications could also benefit from being retired and recoded in another database program.

PRICE SENSITIVITY Specific new applications, though, don't make the next 1-2-3. Or the next dBASE III. What does it take to be a runaway best-seller in this market? You need a unique and useful mix of features marketed at a price that's more shocking than competitive. Borland International has proved this with Reflex, its \$99 database package that used to cost \$495. Like the makeover pages in the women's magazines, there is a clear before and after. Before was measured in thousands of units; after is racking up hundreds of thousands

At the PC Computer Forum in February, a bunch of us sat around after the sessions and played, "Let's Fix Product X." The idea was to suggest the half-dozen best changes that could be made to a product that seemed to deserve better than it was getting in the marketplace. The game got boring after four products because the first



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Brenda Hudson, Data entry and proces for Sark Enterprises

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> Gita Beant, Economics ma et IIC Indee

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Drive Controllers Popular Expansion Boards PC Technician provides instruction not found in books or magazines. It is an essential tool for anyone interested in understanding their PC You can't afford not to have PC Technician. Other products

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■ FROM THE EDITOR'S SCREEN

three changes were always "improve the user interface, remove copy protection, and drop the price."

You might infer from this that technology is price sensitive, and you'd be right. It's also performance sensitive: a new product must clearly outstrip the old. Nobody's going to code new applications in dBASE II now that III Plus is available. VisiCalc didn't stand a chance once there was a 1-2-3. But Symphony wasn't the product to put 1-2-3 away, either.

DETHRONING 1-2-3 It's doubtful anything can knock off 1-2-3, though people have tried. VP Planner from Paperback Software is widely acknowledged to be closer to what 1-2-3. Release 2.0, should have been than Lotus's version was. I saw VP Planner for \$57 in a mail-order ad: a lot of capability for a low price.

Then there's Javelin. Its creators really do have a better idea about how to analyze business problems. But it's not the way most people work. If you give people with a spreadsheet a problem to solve, first they'll throw all the relevant numbers into some likely rows and columns, then they'll play with formulas to see how they relate to one another. Then they plug in a few what-if variables, and they're all set.

You can do that with Javelin, too, but you'd be using only a tiny fraction of the program's capabilities. Javelin encourages you to get all your relationships straight, then put the numbers in. While 1-2-3 is merely adequate for time-series analysis, Javelin is superb. Sure, you can use 1-2-3 if you don't mind typing in "Jan Feb Mar Apr..." every time you start something new. And yes, you can use named ranges in 1-2-3 but not before you've created the ranges. Javelin's technology is clearly better, but it's trying to face down more than a million entrenched 1-2-3 users.

Also, the way corporations buy products like 1-2-3 is commonly misunderstood. 1-2-3 was the quintessential bottom-up product. But the mythology today is that it's sold from the top down. That's because MIS departments realized that they'd be reduced to ridicule if they didn't approve what their users had already embraced. You wind up with a tautological technology barrier-users won't take a chance on the new, potentially better product without the blessing of MIS. The PC support groups are loath to take a chance on something that their users aren't already wild about. Note that this phenomenon oc-

expensive. Under \$100, users and managers alike will take big chances.

Be magnanimous. Help put new products to work. Test drive a new technology curs only when the product in question is today, at a computer near you.

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A LITTLE-KNOWN BUG IN DOS 2.1



When you do a COPY *.* command with a lot of files in DOS 2.1, every 256th file will be ignored. Norton shows you how to fix this bug and offers a tip for when you're using *.*.

The main topic of this column is some problems with DOS 2.1 and how to solve them. But before 1 go into that, 7 ld like to talk about some interesting things I learned since I wrote about the Roland MB-142 monitor (Volume 5 Number 3), which glows white rather than green or amber and can be flipped into reverse-video mode.

I've recently discovered that some of the flaws that I commented on can be overcome by a screen-driver program that Roland will supply to its users. For example, I reported that if you use a Roland together with a Hercules graphics card, the screen image can shift from side to side when you switch between text and graphics modes. causing some of the displayed information to disappear off the side of the screen. Roland's screen driver cures that problem. (You can get the screen driver by writing or calling the company (7200 Dominion Circle, Los Angeles, CA 90040; (213) 685-5141) or off its bulletin board ((213) 438-6783.) Needless to say, I was quite peeved that as a cash-paying customer who just bought an MB-142 at a local computer store, the salesperson didn't give me or tell me about this patch that makes the Roland more usable, but those are the breaks. At least now you know about it.

On the whole, though, despite the patch and the favorable impressions of PC Magazine contributing editor Glenn Hart and several Roland users who wrote in, my criticism stands. Because of limitations in the display adapter (rather than, I suppose, limitations in Roland's design), the reverse-video, black-on-white mode just

doesn't deliver what's needed for reversevideo mode to really work—a full, wide white border around the active part of the screen. Take a look at an Apple Macintosh screen, and you'll see the importance of a

As I said originally, I'm really sold on the idea of black-on-white screens, and I was willing to lay out a wad of money for the MB-142 in the hope of getting it. But for the IBM PC community, reverse video's time has not yet com-

DOS 2.1 DANGERS John O'Boyle wrote in with an interesting and dangerous problem that lurks in DOS 2.1 but has been fixed in later versions. I suspect that 2.1 is the most widely used version of DOS, so this problem is lying in wait for hundreds of thousands or even millions of PC users. As you can guess, the problem only crops up in unusual circumstances (otherwise, I'd have heard about it long ago), but when



it does, it can be disastrous.

What happens is that if you do a COPY

** command with a lot of files, every 256th one won't be copied; it will be ignored. Now you don't often copy that many files at one time, particularly if you're working with floopies, however, if you're managing your hard disks, moving files around to reorganize, or working with the popular Benoulli Box carridge hard disks, you've got a good chance of hitting this hidden problem.

This problem would simply be a minor annoyance if you knew about it (particularly if you knew the name of the missing middles) but, of course, DOS 2.1 doesne, DOS 2.1 doesne,

DEFENDING YOURSELF You can defend yourself against such problems a couple of ways. The quickest way is to use the DIR command to obtain a count of the files in both locations (that only works, though, if the target directory, where you copied the files to, doesn't have other files to confuse the count). A longer but better way is to use the COMP command.

COMP, as you know, compares the contents of two files to make sure they match. Using COMP is a terrific way to check that the target has every file that appears in the source file list and also to dou-

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ble-check that the data in the files match You do it by giving COMP the same specifications that you gave COPY, for example, COMP C: * . DOC D: * . DOC.

Of course, if DOS 2.1's COPY com-

mand skips every 256th file, its DIR and COMP command might, too (1 can't test that for you myself because none of my machines are set up with that old but popular version of DOS). Ugh, again.

As a general rule, though, when you're slinging files around with the COPY command, it's not a bad idea to double-check everything with the COMP command before deleting anything.

A HANDY TIP ON FILE SPECIFICA-TION I can pass along a handy tip that will help when you're moving or copying files or doing anything that would involve the venerable *.* file specification. If you give DOS just the name of a directory (for example, "C:\FILES"), that implies a star-dot-star file specification. Note that you type only the directory pathname, without a final backslash ("C:\FILES", not "C:\FILES\"). The special exception to that rule is when you're referring to a disk's root directory, which must end in a backslash ("C\")

If you experiment with this technique. you'll find that some of the DOS commands will work whether or not you put a backslash after the pathname, while others will only work properly without the final backslash. This is due to an interesting quirk in the way DOS handles explicit and implied wildcard filenames, which we'll go into another time (it's a fascinating topic by itself). Rather than butt beads with the inconsistency, the best thing to do is leave off the last backslash when you want to use a pathname as shorthand for the pathname plus star-dot-star.

This type of trick, by the way, doesn't apply only to named directories. You can also avoid having to key in *. * to refer to the files in the current directory by using the directory notation ".". Everybody has noticed the two special names that appear in each subdirectory that you create, the names "." and

"..", but not everybody knows what they mean or how to use them to good advantage. One dot refers to the directory you're using. and two dots refer to the parent of that directory. Every subdirectory has a parent directory, though of course the root directory does not. While the root directory on each disk doesn't explicitly have either of these "dot" entries, it implicitly has the single-dot entry, ",", which always means "this directory right here."

These dot directory entries exist for a couple of reasons. One is that DOS itself uses them to navigate through directories. (If you're bold, you can experiment with



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this by using a patching tool-DEBUG, in my program, The Norton Utilities-to zap out one or both dot entries from a subdirectory and see what happens when DOS tries to deal with the disk.)

IMPROVING FILE MANAGEMENT These dot entries also help us deal with the complexities of our directories. We can use these dot entries two ways. One helps make batch files work in any directory on the disk, and the other speeds up manual DOS commands.

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If you give DOS just the name of the directory,

with no final backslash.

that implies *.*.

that are spelled out explicitly, these maintenance batch files are tied to the specific directories for which they were written. But if you use the "." and ".." names to refer, generically, to the current directory and its parent directory, you can create some batch files that will work anywhere on your disks.

You can also use the dot entries to save time keying in direct DOS commands. For example, if you're trying to copy or delete all the files in your current directory, specifying "." (meaning the current directory) is equivalent to keying in *.*. This is because specifying the directory name, either by its full name or using ",", implies all the files in the directory. And "." is a lot easier to type (not so much because it's one character rather than three but because your fingers have to dance all over the keyboard to type in *.*).

Saving a little typing is no big deal, but it can be a convenience when you're doing a lot of file-maintenance work. Disk file maintenance is so important and such a nuisance that I'm planning to release a new program that's tailor made to high-speed, high-power disk management.

There's a lot to learn about coping effectively and efficiently with the huge capacity of a hard disk. Also, there's plenty to say about dealing with disk disasters. like when your disk partition is deepsixed. We'll talk about that and other disk problems in the next issue.

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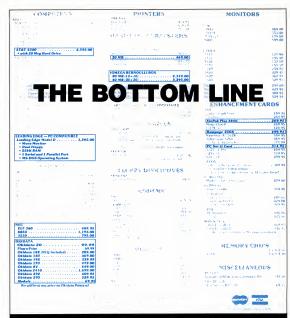
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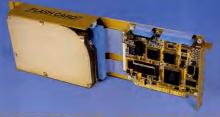
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AWAITING THE CD-ROM BOOM



The market for CD-ROM read-only optical disks is about to blast off. But the question people should be asking is: Where is it going?

et me say it plainly: CD-ROMs compact, read-only optical disks are the single most interesting opportunity lurking on the personal computer horizon.

These shiny little disks are going to be the lever that gets PCs into the home on a permanent basis. They're going to transform how we acquire, search, and use many kinds of information. And they're going to create the next generation of computer millionaires.

But I wish we understood better how we're going to use them.

Over the past year and a half I've spent an awful tot of time sitting in clients 'offices, trying to divine just where the CD-ROM market's going to go. Or where, more likely, the first wave of publishers of optieal disks is going to push the market.

CREATING A MARKET American enterperseurs has ewakened to the extraordinary opportunities lurking in this as-yet unborn market. Would-be CD-ROM publishers are scuring auround frainfaulty, ying up the rights to existing material while at the same time trying to figure out what kind of new material may be appropriate foodler for the CD-ROM market.

Right now. CD-ROMs are victims of the chicken-and-egg syndrome: we won't see CD-ROM players selling well until there's a reasonable base of optical disks to run on ther—orts, something useful to do with those players. And conversely, we won't see a wide variety of optical disks on the market until there's a reasonable installed base of players—in other words, something useful to do with all those disks.

The members of the High Sierra regroup—Sow, Microsoft, and friewood, and friewood, and friewood and extended that conundrum all too well. And they understand that understand that when they jump in and effectively subsidized stakes of the first few hundred though players and disks, this enormous market may die aborning. So I think set may die aborning. So I think set may die aborning. So I think and the corner ComputerLand fairly soon—and at surprising-ly agreestice in the safety so the set of the safety so the safety safe

WHAT WILL WE SEE ON A CD? When the market achieves "eritical mass." though, we still have to deal with the nub of the issue; just what kind of information do you and I want to buy 500 megabytes worth of on a CD-ROM? And how much will we pay for it?

Growing out of that year-and-a-half's



experience working with people who want to become the Henry Luces of the CD-ROM universe, I've come to hold some fairly strong views about the nature of the market for CD-ROM disks and about how much you and I are going to be willing to pay to play the optical-information game. Here are four of those views:

I. Very wide and very narrow markets hold the greatest promise for CD-ROM publishers; the middle ground is a death trap. The early successes in optical publishing are giong to be disks trapeted at very narrow-interest markets (lawyers needing ease citations or manufacturers publishing disk catalogs of parts) and at very broad-interest markets (encyclopedias and other mass-market reference works).

2. A tot of the value of optical disks will depend on the quality of the indexing and depend on the quality of the indexing and search-and-terrieval software provided on bed in the disk. The point is not just that CD-ROMs let us put a lot of information in one place and then reproduce and sell that information cheaply; it's that with the power of the computer to help terrieve things, we'll finally be able to find what we're looking for.

But unless really superb searching tools are included on the disk, we'll miss most of the value of CD-ROMs. Not nearly enough attention is being paid today to developing effective, easy-to-use searching tools for CD-ROM use.

 CD-ROM publishers have to recognize that their existing approach to pricing has been made obsolete by CD-ROMs.
 You should hear how violently some of the

JIM SEYMOUR

people in the on-line database business condemn the appearance of the CD-ROM market. These "IPs." or information providers (as distinct from the service-bureaulike outfits that maintain information on

their mainframes and collect from you and me for looking through it), feel the whole structure of their business is threatened by CD-ROMs.

MODE N

And they're right.

Because what they've been selling forever and ever is not information but access to information. One of the largest and bestknown on-line databases for lawyers, for example, tried until fairly recently to keep customers from downloading data to

The "pay per view" approach to databases has been made obsolete by CD-ROMs. Information providers have to recognize that when they sell us a CD-ROM disk, or a library full of CD-ROM disks, they transfer that information to us permanently, rather than nibbling at us time and again as we come back to take a look once more.

However . . .

disks.

4. The need to have current information

 CD-ROM disks will transform how we. acquire, search, and use many kinds of information. And they'll create the next generation of computer millionaires.

is going to push most business-information CD-ROM publishing into subscriptions, not onetime sales. And that's going to provide the continuing revenue stream IPs fear they'll lose with CD-ROM sales.

A great percentage of what you and I will want to buy on optical disks is perishable information. The useful life of the material will vary, but obsolete information is dangerous misinformation, so we're going to expect upgrades on some definable cvcle. Which means we'll subscribe to a service that sends us whole new disks every so often

From time to time I'll look at what's happening in the CD-ROM business. For now, what we need are some cheap, reliable, widely distributed CD-ROM players, and a few of those broad-market disks to get things rolling.



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STANDARD? WHAT STANDARD?



Defining True Blue's standard PC isn't easy; it's a rather fuzzy category. But it's just this lack of precision that's given the IBM PC its longevity.

This magazine calls itself "The Independent Guide to IBM-Standard Personal Computing." Excuse me for asking, but what standard?

The so-called IBM Standard is like pornography: it's hard to define, but you know it when you see it. It certainly has some connection with a family of chips from Intel, a particular BIOS, a certain operating system from Microsoft, and absolutely nothing to do with running Apoleworks.

But even that's rather fuzzy. Different versions of the 808 microprocessor grace the sockets of PCs and XTs, variant 80268s have bloomed in AT-least machines, and clones often use chips unsent in the True-Blue world. Blue changes the BIOS on occasion, so deviant ROMs lurk, in PCs and ATs. And each DOS upgrade is sufficiently different from its predecessor to knock certain software out of the running.

DISA ORIGAM! Is the standard in the disk! Had disk disk! Had disk drives can't be part disk! Had disk drives drive had disk! Had disk drives drived had disk! Had disk drived had disk drived had disk drived had can't with a 80 strank drive dask and this come format! And what of the Data Generals and Hewlett Packards that can fit faredards that can fit faredards that can fit faredards that can fit faredards that can fit fared with some years drives only via some very cleaver original!"

The standard keyboard, of course, is the much-maligned unit packed with just about every IBM PC and XT. But the AT comes with an improved model, and the RT keyboard is rumored to become the across-the-board IBM standard henceforth in perpetuity or until something cheaper comes along. Laptops' keyboards adhere to these standards about as assiduously as the PCir's keyboard does.

You want display standards? We've got cmt. There's the IBM Monochrome standard, the Color/Graphics standard, and the Enhanced Graphics standard. They're sort of, but not entirely, compatible with one another, and even IBM distributes programs that won't work with them all. Add in Professional Graphics, the displays available for the RT, and Hercules and other third-party schemes, and you can start your own bruzen of sandards.

Printers, of course, have absolutely nothing to do with standards. Any word processor worth its menus now comes complete with different drivers for over a hundred printers. Control codes aren't



even consistent among IBM's own machines, and IBM's diagnostics deny certain printers' very existence.

Cables aren't standard either. A PC serial cable won't work on an AT, and a modem cable may not drive a serial printer. Parallel printer cables are thought to be standard. They're not.

Firmware? The most standard thing in a IBM PC is probably the ROM holding 32K of Cassette BASIC, but you won't find it in any clone on the market. Changes in the motherboard and cabinet assure that any simple instruction about such mundane subjects as removing a seriew or setting a switch is likely to be irritatingly inapt for many users.

WHAT IS THE MEANING? So what is the meaning of "IBM-standard Personal Computing"? Near as I'm able to figure it, it's this: if a machine can somehow or other be made to run software designed for an IBM PC, it's considered part of the "IBM Standard."

Now, I don't consider that much of a standard. It's about as specific as "motor vehicle"—something that can move along the ground under its own power and isn't powered by rubber bands. But the motor vehicle industry disn't lock itself into rigid standards early in the game—and hasn't come up with all that many yet, as a visit to any parts shop will prove. Considering that we might all be using tillers to steer our steam cars, this looseness is probably a good thing.

And so is the looseness of the IBM PC standard. For all we complain about the

STEPHEN MANES

lack of precise standards-and do we ever!-this very lack is what's given the IBM PC its remarkable longevity. Nobody wants to be stuck with an original IBM "standard" or even last year's.

Mass storage has improved from cassette (!) to single- and then double-sided floppies to hard disks, with optical storage on the horizon. The original IBM PC had no provision for RAM above 544K, and

DOS none above 640K, but both limitations have been surmounted. Insufficient expansion slots led third-party vendors to develop multifunction cards and IBM to add extra slots and more power to the XT. The 8088 was too slow for some so 8086 80186, and 80286 machines followed in quick succession. Total compatibility hasn't been maintained, but the upward migration path has been kept remarkably

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MICRO COMPUTER **BUSINESS SERVICES** FLEXIBLE STANDARDS Macintosh's attempted imposition of a standard-"Any color you want, so long as it's

smooth.

black"-failed miserably. If a computer is to be as personal as a car, you want the right to customize it and soup it up any way you please. That virtually demands flexible "standards"

True, this flexibility slows down certain kinds of development and complicates sales to first-time users. If color were standard, Microsoft Windows might conquer the world. If PCs were genuine commodities, people could buy on price alone instead of worrying what incompatibilities lurk within their clones. But when stone tablets arrive with IBM standards engraved upon them, sledgehammer sales may skyrocket. Forced to give up my monochrome monitor for a flickery graphics-based screen, I might just give up IBM instead

Standards are often conceived in response to temporary or imaginary problems. IBM used to push a silly software standard that included inverse-video function-key labels at the bottom of the screen. Bright engineers assured me not long ago that data transmission over voice-grade lines was impossible at speeds higher than 300 bits per second.

Corporate types may find that standardization makes their lives easier, but that's not yet what personal computing is all about. Sure, we need standards, especially when it comes to networks and information exchange and getting software X to work with hardware Y. But we also need better, faster, and easier everything.

This field is still in diapers. We needn't settle for Standard Brand Junior Strained Carrots in Tommy Tippee bowls. Pheasant under glass awaits if only we can learn how to toddle to it.

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THE ZEN OF ARROGANCE



Arrogance has long been both a cause and an effect of success in the personal computer industry. But is there a place for humility?

ost people who use computers think that manufacturers and software publishers spend most of their time worrying about things like ease of use, user interfaces, and computer dealers. Actually, one of the most hotly debated issues in computer company back rooms is the role of arrogance.

Arrogance can be both the product of success and the apparent source of success, which is what makes it such a holy debated issue, is in necessity, industry executives ask themselves, to be arrogant in order to be successful? Or does arrogance inveitably lead to allure? And, if it does, does humility necessarily lead to success? And why have so many nice companies been unable to rise above the industry's general noise level.

The word arragamer has a nassy ring to its Tow would rive want your daughter to marry an arragant man. But, in fact, many of the most successful people in the personal computer industry—entrepreneurs, programmers, marketer—are also some least observers to wonder whether there is come relationship between arraganter as success. And the corollary is that most of the truly interesting people in the industry are also the most arragant, meaning that the quality must have some value.

A LONG TRADITION The industry has found some validity in the theory that arrogance is necessary to achieve above-average success. Arrogant behavior has a long tradition in the industry: it was essentially defined by Apple Computer cofounder

Sieve Jobs and refined by Osborne Computer founder Adam Osborne. A long list of people accused of arrogance have joined these two: ComputerLand founder Bill Milland, VisiCorp cofounder Dan Piylar, Micropro founder Seymour Rubinstein, Borland International president Philippe Kahn, Lotus Development cofounder Mitch Kapor, Microsoft founder Bill Gates, and even the founder of IBM's Entry Systems Division, the late Don Faridee.

Borland International, for instance, is widely considered the most successful new software company to have come along since Lotus Development was founded in 1981. Yet it is run by a man, Philippe Kahn, who is also widely considered one of the most arrogant industry leaders to have graced the pages of the trade pressince Adam Osborne began writing a column called "From the Fountainhead."

At the same time, humility also must play a role in the industry. Three of the most con-



sistently successful companies—Software Publishing Corp., Compau Computer Corp., and AST Research Inc.—are all run by straightforward, sincere people who don't have an arogant bone in their bodies. Yet Software Publishing Corp., cofounded and run by Fred Gibbons, one of the most direct personalities in the industy, is suddenly facing the prospect of declining revenues and bad press.

A LEGITIMATE ROLE So what's the truth of the matter? The truth is that arrogance does indeed play a legitimate role in the personal computer industry. The PC business is driven by a relatively new and rapidly developing technology; companies must confinantly introduce new products that can solve new problems and offer more value.

But often the only way to stay ahead of the competition is to take enormous risks. Many companies, for instance, must bring out new products that make their biggest moneymaker obsolete to avoid having another company do it for them. The kind of people capable of contemplating such risks tend to have enormous egos.

But arragance comes in two forms, personal arragance and ecoporate arragance. Personal arragance and ecoporate arragance. Personal arragance is that of an individual who displays egotistical behavior not necessarily shown by others in the same company. Corporate arragance is displayed by an entire company, although no one individual might act egotistically. Of course, companies must be personally arragant people tend to show signs of corporate arragance more resultly than those nut by humi-

■ STEWART ALSOP

ble people, but they are separate

And, while some personal arrogance has a legitimate role, particularly in companies that are just getting started, corpo-

rate arrogance appears to lead almost certainly to rack and ruin.

Apple Computer, which benefited initially from Steve Jobs's arrogant assumptions about the personal computer market, started making serious mistakes when the rest of the company began to believe it was infallible. Apple, for instance, falled to get people to perceive the Macintosh as a basiness computer. Many people blame Jobs for that failure, but what kind of company would allow viself on network television during the Super Bowl to depict business buyers as a bunch of lemmings following IBM over a cliff? A company that thought it could do no wrong, that was guilty of

Borland International on the other hand, has been successful because its founder is arrogant enough to take big risks in the kinds of products his company has introduced. (Arrogance also helps get publicity.) But the company doesn't display

corporate arrogance.

 Most of the truly interesting people in the industry are also the most arrogant.

the kind of corporate arrogance that makes it stop listening to its users or its dealers and begin to believe that it is incapable of doing anything wrong. Borland has been successful specifically because it doesn't take anything for granted, including its ability to predict the needs of users.

What's most remarkable is to see a company recognize its corporate arrogance and systematically eradicate it, something that only three companies have managed. Apple Computer, now under the watchful eyes of John Sculley, is far more sensitive to what its users want than what it thinks its users should have. Ashton-Tate-now run by a man (Ed Esber) who watched corporate arrogance destroy his former employer, VisiCorp-is aggres-sively humble, to the point that it is inviting some of its customers to participate in the design of new products. And Microsoft, once confident that any product it produced would be instantly accepted, has learned from experience that it's much easier to listen to its customers than to try to force its customers to listen.



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Your computer lives on electricity, but not on irregularities in the power line. Fair warning: Too little electricity can knock the PC unconscious; too much can fry its brain.



POWER CORRUPTS

(BUT YOU CAN PROTECT YOUR PC)

E

lectricity is the lifeblood of every personal computer, the vital essence that makes its circuits flip and flop to transmit its every thought. But the electricity is a precarious balance. Too little, and the computer's thoughts can become muddled, it can even develop digital amnesia. Too much electricity, and the PC's fragile semiconductor circuits may be so strained that they stop working at all. The damage is permanent—and expensive.

Electrical problems are probably the leading cause of death of computer equipment and the leading cause of frustrationand wasted time-among PC users. While in theory the solidstate circuitry of personal computers should never wear out, at least as long as the electrical supply is working optimally, the current on the power line often is far from optimal. The PC's power supply, the sealed silver box in the right rear of the system unit, attempts to compensate for most vagaries of line current. But severe power-line pollution can sneak past its protections and wreak havoc inside the circuitry. either eating away slowly at the computer's life or snuffing it out in a single, explosive pop.

Even in the absence of physi-

■ POWER CORRUPTS

cal damage, power-line inconstancies are the bane of the PC user. Next to carelessness, power problems are probably the biggest cause of lost data. An interruption in the current supplied to the PC lasting less than a second is enough to ersae every byte of data in the computer's memory. Yet the PC has no bulk-in means of protecting itself from lapses in its supply current.

Power-protection devices are your PC's primary line of defense against the various evils lurking in the electricity supply. Some, spike and surge suppressors, protect against hardware-damaging electrical excesses. Others, standby and uninterruptible power supplies, protect your data against electrical interruptions. All help

preserve your peace of mind and sanity. In this and future issues, PC Magazine will investigate and evaluate the various protection devices that you can add to your system, their effectiveness, and their worth. Our first examination, in the article that follows this one, deals with spike and surge suppressors or protectors, which prevent the ultimate in fatal errors, equipment damage. In a future issue, we'll delve into data-saving backup power supplies. To help you understand why these devices should be considered necessary adjuncts to any computer system, the balance of this article will examine how power-line problems develop, the differences between protection devices, and how they work.

All power line-related problems can be divided into three types, each with its own consequences for your system: overvoltages, undervoltages, and noise. Noise is actually not a real problem; see the sidebar "The Noise Nonissue."

ON FIRE Overvoltages are transient conditions in which too much voltage is supplied to your equipment. Normally the PC power supply compensates for voltage fluctuations, reducing excesses of 10 percent or more down to the optimum level before they can get to the active circuitry of

Winn L. Rosch is a contributing editor to PC Magazine. He has 10 years' experience working on high-power systems as a chief engineer and holds an FCC general radiotelephone license. He is also a practicing attorney. the computer. If the overvoltage is severe enough, however, it can slip by the protections built into the power supply and permanently damage the computer hardware, iterally blowing up one of the semiconductor chips inside your computer. Or the overvoltage can actually damage the power supply itself, and in so doing lay waste to the whole of the computer's circuitry.

SPIKES AND SURGES Overvoltages that differ depending on the duration of their voltage excess. Spikes are overvoltages that the from nanoseconds to milliseconds (billionths of a second to thousandths of a second). Surges are overvoltages that last from milliseconds to seconds. Either of these overvoltage conditions can also be classified by two magnitudes: its voltage and its energy content.

The energy content of an overvoltage is the product of its voltage, the current flow, and its duration. The higher voltages of the spike or surge cause greater current flows that, because all practical electrical circuits have internal resistance, cause heat inside these circuits. In normal operation, the circuits of the PC warm up from the effects of resistance and current flow, but their term-

perature stabilizes because the heat is discussed.

In partial about the same rate it is generated reaches a partial at about the same rate it is generated. The energy of a surge causes a very nogled returned to the temperature increase insides semiconductor returned to the cause of the cau

Because the microsopically thin gates of the NMOS (N-channel Metal Oxide Semiconductor) circuits that make up the bulk of the PC's thinking elements are extremely delicate, only a small amount of total energy is sufficient to destroy them. Thus a brief pulse of high voltage, a spike, or even static electricity can ruin an NMOS device. The danger is real. Brief peaks as high as 25,000 volts have been measured on normal power lines.

Some studies have shown that spikes below the level that causes NMOS circuits to fail catastrophically nevertheless may alter the crystal structure of the semiconductor, degrading it and making it more vulnerable to later spike damage. The

THE NOISE NONISSUE

Despite dire warnings from noise protector makers, your PC has enough built-in noise protection.

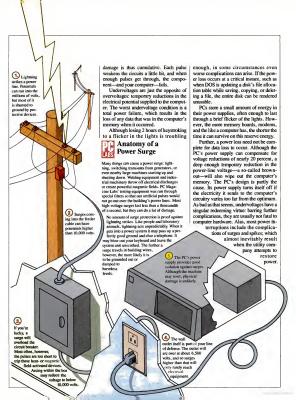
Noise is any signal present on the power line besides the expected 60-cycle alternating current your PC knows and loves. It's the equivalent to the pops, crackles, and buzzes you often hear in the background of AM radio broadcasts. Noise usually consists of short-term over- and undervoltages that for the most part balance out over the long run. As such, noise is similar to the signals inside a PC that actually carry out its thinking.

Should a stray and sufficiently strong noise slip through the filtering that is built into the PC's power supply and mix itself in with the logic signals in the computer, the noise could cause data errors and memory bits to randomly change state,

possibly resulting in parity check errors that are fatal to the program you're running (and possibly to your disks).

Despite the dire warnings given by the manufactures of noise-filtering devices, however, noise in itself dex not appear to be a major problem for PCs. To meet FCC standards for the emission of radio frequency noise, all IBM personal computers have built-in filters that prevent their internally generated noise (actually, their electronic thoughts) from leaking their electronic thoughts) from leaking their leaders of the result of the results of the resu

computer.-Winn L. Rosch



WHAT ABOUT STATIC ELECTRICITY?

It's in the air, it's everywhere. How can you protect yourself?

And do you really need to?

Static electricity is everywhere, and Sevidence of its presence abounds. Static is so familiar, in fact, that learning how to concentrate a charge and create a spark or benign shock is one of the great rites of growing up.

But can static electricity, so easily produced, actually damage your personal computer, floppy disks, keyboard, or disk drives? Probably not—but there are exceptions. The good news is that the precautions available are simple, cheap (or free), and reliable.

Static electricity causes potentially damaging sparks or invisible voltage transfers when one charged object comes near or touches another object that has a different charge or no charge at all. Since the human body is well designed to accumulate static, it is an excellent vehicle for transmitting it.

DO-IT-YOURSELF PROTECTION

There are several ways to rid yourself of-or at least reduce-static electricity in your body. The simplest and certainly the cheapest method (it's free) is to ground the charge, literally sending it to the ground. Technically, this can be achieved only by touching a good conductor that is itself in contact with the ground. But you can achieve nearly the same effect by touching an object capable of absorbing the charge. The best static absorbers are good conductorsfor example, metal objects. Touching a metal object before you sit down to work at your computer is a reliable antistatic procedure as long as you don't forget to do it

Product solutions are abundant. They range from sprays costing under \$10 per can to antistatic touch mats for \$19.99 to a \$179 "static eliminator" that absorbs static charges in the environment, thereby preventing buildup on clothing or in the body. Those of you worried about



Shown here: Electrostatic Locator, \$320 with carrying case from act Inc. (Elk Grove Village, Ill.); Touch Me First mats, \$69,96 and \$39,95, and the First Touch keyboard strip, \$19,95, all from the \$3M Corp.; Antistatic gripper chair mat, \$160 from Global Computer Supplies (Plainview, N.Y.); Static Free aerosol, under \$10 from Chemtronics (Hauppage, N.Y.).

PC MAGAZINE MAY 27, 1986

how much static is in your work environment can purchase an electrostatic locator for \$320.

According to PC Magazine contributing editor Winn L. Rosch, the best static preventive is an interior humidity level between 30 and 40 percent. Humid air absorbs static in the same way that a staic mat does. Dry air, a common indoor condition in the winter (caused by heating), has the opposite effect.

WORST-CASE SCENARIO What if you choose to ignore static or should forget to ground yourself on a winter day when the air in your office is crackling dry? What's the worst that can happen? There's absolutely no agreement on this. Rosch, who lives year-round in Cleveland, says he has never seen static electricity harm a PC. Contributor Phil Wiswell, who reviews surge suppressors in this issue, tends to concur, but he is careful. Wiswell, who lives in Westchester County, just north of New York City, says, "It's enough of a precaution to touch my metal desk lamp before using my computer." At the other end of the anxiety spectrum, Mike O'Cone. PC Magazine's product-testing editor, says that he has frequently suspected static as the cause of hardware and software damage. "I'm very static conscious." says O'Cone, "I always take standard precautions to protect my equipment." But even these are not elaborate. O'Cone relies on mats and sprays.

In any case, it is difficult to demonstrate the effect of static electricity when transmitted to a PC and almost impossible to prove that static was the cause of damage. The effects of this ephemeral force are often written off as unexplained computer weirdness.

Not surprisingly, the people who make the most noise about static have an antistatic product to sell. 3M Corp. which markets a keyboard strip, maintains that such electrical eccentricities can be caused by the sudden electrostatic

discharge from the user to sensitive computer components.

A perceptible static charge is about

■ The more exposed a computer's hardware components are, the greater the potential for static problems.

3,000 voits but as little as one-fifteenth of that can affect some components. Computers are particularly susceptible, as state charges can miner binary signals. However, even 3M concedes that state's damage potential is much reduced by the law of averages. The company maintains that there is a one-in-a-thousand chance that the equipment will recognize a static signal as a command and perform an unintended function.

The worst-case scenario involves the loss of data, but if normal backup procedures are used this loss should be minimal. Still, strange characters on the screen, keyboard lockups, or program freezes have all been blamed on the static bogeyman.

HIGH-RISK SITUATIONS The more exposed the computer's hardware components are, the greater the potential for static problems. This means that extra caution is called for under some circumstances—for example, when installing memory chips. Fewer than 500 volts can burn up the silicon iunctions or eates in-

side the integrated circuit that is detached from the board. Once the chip has been inserted in the board and installed in the computer, however, it gains good though not foolproof—protection from the effects of static charge.

Accumulating 500 volts is a cinch. You can generate up to 35,000 volts just by walking across a carpet in a low-humidity (below 30 percent) environment. Even when the humidity is high, contact with a carpet can generate a fleeting charge of up to 1,500 volts. Simply sitting on polyurethane foam in a seat cushion can generate between 1,500 and 18,000 volts, depending on the humidity. Measurements of up to 6,000 volts have been recorded from the movement of clothing agains the body in a dry room. If that clothing is made of synthetic materials, just moving your arm can create a substantial static charge.

The possibility that your computer will suffer data loss or physical damage from static electricity appears to be remote. But precautions are so simple that it's a good idea to implement them, especially if your working environment is characterized by low humidity. Sprays and pads are cheap and generally effective-although sprays work only if you use them. The only way you can tell for sure that their effects have worn off is when the static builds up enough to cause a spark or shock, by which time it may be too late. Or you can treat static as a superstition and train yourself to ground your body's charges by touching tables and door frames before sitting down to work. Using these minimal precautions, you can be fairly certain that static electricity will never cause a major problem.

Should you want to engage in a familiar juvenile rite, however, chances are excellent that you will be able to summon up enough static to shock your family and friends.—Virginia Dudek

■ POWER CORRUPTS

Your natural reaction to a brownout or ficker in the lights, inmediately saving your work, is probably the worst possible bing youc and occranish the dimming or flickering lights are often a warning or flickering lights are often a warning or disk at that time makes it many times more probable that the ultimate power failure to the probable that the ultimate power failure disk! file allocation table. Trying to save your work before the power completely fails thus promises the greatest chance of loning not just the data in your computer's memory, but the disk you are trying to save it to as well.

SEEDS OF DISASTER As with just about everything else in the world, power line-related problems can arise either naturally or through the works of man. Manmade blackouts range from the simple. stupid variety-flicking the wrong switch, tripping over the power cord and pulling the plug from the outlet, or failing to notice your hungry and very surprised cat gnawing through the power cord-to engineering miscalculations that black out an entire power grid. Natural causes include all the favorite Hollywood disasters-earthquakes, hurricanes, and tidal waves-as well as ordinary thunderstorms. The one quality shared by all power-line problems is unpredictability. You never know which sort of disaster will next befall you.

Spikes and surges pop up wherever a job for electricity is unleashed on the power line. The most spectacular jolt is, of course, lightning. When a bolt out of the blue strikes a power line, part of its mullifest and the spike of the spike of the power line. The spike of when the lightning doesn't directly strike the wire, the electromagnetic field that surrounds it can induce tens of moustands or volts into any conductive material it with the spike of the spike of the power voltage is induced. Mister the spike of the power voltage is induced. While the criffics of a galact a big charge indeed.

Any wire, not just power lines, can attract energy from lightning, and any wire that connects your computer to the outside world can bring potentially damaging voltage to its circuitry. Last year, a thundrastorm struck near the suburban New York home of a PC Magazine editor. A surge suppressor in the power line protected his

PC, but the telephone line carried enough energy to destroy his modern and the parallel port it was connected to inside his PC. Needless to say, after buying a new modem, he added a surge suppressor to his telephone line, too.

The biggest man-made spike generator is the switching of inductive devices. All electric motors and transformers generate or "induce" magnetic fields that actually

When a bolt out of the blues strikes a power

line, part of it may be rerouted toward your computer.

store electrical energy. When one of these devices is switched off and the magnetic field "collapses," all of this stored energy has no place to go, except down the stored energy line as a spike. Even relatively small electric motors, like those that power refrigerators and air conditioners, can cause spike of thousands of volts. Longer surges, those that may stretch out for several seconds, fore result when the electric utility adjusts its equipment to make up for changes in the electrical deformand.

You can't get away from these power problems. If you live or work in a densely populated area, man-made switching transens will about fly you live and work in a rural area, you'll probably encounter fewer man-made problems, but the greater streeches of transmission line across the countryside will be more susceptible to you try to avoid the problems involved in mover transmission by generating your own electricity with a windmill or hydrocettic plant, your PC will still be prey to transients created by the various inductive papilances within your home or office.

PROTECTING AGAINST SPIKES Because you cannot avoid power problems, your only choice is to protect your computer system against them. The only way to avoid the possibility of damage from power-line surges and spikes is to stop them from reaching your PC. Surge (and spike) suppressors do exactly that, chopping power pulses down to a digestible size, keeping them within a range that's safe for your computer.

Most inexpensive surge suppressors use special electronic components called "varistors" that conduct electricity only when the voltage across their leads exceeds a certain level. In effect, varistors short out the excess voltage in spikes and surges before it can pop into your PC. The voltage at which the varistor starts clipping spikes is termed clamping voltage.

Other devices, such as semiconductors, ionized spark gaps, and ferro-resonant transformers, are occasionally used to eliminate overvoltages. Although based on different technologies, they effectively work the same way, clamping voltage at a given level.

The varistors in surge suppressors are not designed to slice off everything above 120 volts. Because of the sinusoidal shape of the voltage on AC power lines, the peak voltage is 1.4 times higher than its nominal rating. If a surge suppressor had a clamping voltage of 120 volts, the tiny varistor in it would set itself against the whole of the current in the power grid, a confrontation it would be most likely to lose. Also, because normal power-line voltage can vary 10 percent or more from its nominal rating for reasonably long periods, a wide safety margin-often as much as 100 percent-is usually allowed in specifying the clamping voltage of a surge suppressor to prevent the varistor from trying to dissipate too much power from slight overvoltages. Better surge protectors have lower clamping voltages, generally under 200 volts. Some, however, allow potentials as high as 600 volts, peak to peak, to pass unimpeded.

volls, peak to peak, to pass unimpeded. The energy that spake and sugge suppressors silee from spikes doesn't disappear't giets changed into heat, but the stays inside the spike or surge suppressor instead of heating up your computer's semiconductor. Different surge suppressor sors can dissipate differing amounts of energy. If a surge suppressor is too small, a small surge might destroy it. Although surge protectors occasionly fail violently by burning or exploding, sometimes they fail invisibly, leaving you unaware-and unprotected. Thus, a surge protector with a higher energy rating (which is measured in watt-seconds or joules) is better. Some units claim to be able to handle millions of watts, but only for very brief periods.

Surge suppressors also differ in how fast they react to overvoltages. To work effectively, any surge suppressor must obviously react in a period shorter than the length of the shortest pulse it is supposed to protect against. When comparing the specifications of two different models. generally a faster "response time" or "clamping speed" is better. These response times may be as brief as a few picoseconds (trillionths of a second).

BACKUP POWER SYSTEMS To keep your PC purring along during undervoltage conditions or when the power fails completely, you need another source of electricity, either a standby power supply (SPS) or an uninterruptible power system (UPS). Although often classified together as "backup power systems" because they continue to nourish your computer with electricity when the utility company fails, these two devices differ fundamentally in

 To keep your PC purring along during under-voltage conditions or when the power fails completely, you need another source of electricity.

your PC operates on, using a device called an "inverter."

The standby power supply uses a very fast automatic switch (one that operates within milliseconds) to switch your computer from its normal source of power to its battery-based supply. It switches so fast when the power fails that your computer does not notice the interruption.

The uninterruptible power supply or UPS goes one step further. It uses a large battery charger, one able to handle enough energy to power your entire PC. The inverter inside the UPS is constantly connected to your PC and drawing power from the battery and battery charger. Your PC is not directly connected to the main power line. When the electricity supply fails, the battery continues to power the inverter and your PC without needing to switch and with no interruption at all (hence the

name). The advantage to standby systems is that they are inevitably less expensive than uninterruptible power systems; their battery chargers need only be nowerful enough to get and keep their internal batteries fully charged.

Uninterruptible power systems have advantages over standby supplies, however. When normal power is available, they function as the ultimate surge suppressors because their outputs are completely isolated from the power line and all the evil effects of switching transients, lightning, and line noise. Unless extra surge suppression is built into it, a standby power supply will not protect your PC from spikes. surges, and noise. Raw, unconditioned power-line electricity may be routed directly to your unsuspecting computer. Fortunately, most better standby power systems also filter noise and have surge-suppressing circuitry.

The lack of switching is another advantage of uninterruptible power systems. If a standby supply does not switch from line to battery power fast enough, the supposedly protected PC can "drop out," that is, lose power for just long enough that its memory is lost and it shuts itself off, defeating the purpose for which the standby supply was purchased.

Both standby and uninterruptible power systems have two limiting capacities: the caracity of the built-in invester, which de When normal power is available, uninterruptible power systems function as the ultimate surge suppressors.

termines the maximum power that can be supplied at any given instant from its battery, and the battery capacity itself, which determines how long backup power will be available in event of a blackout.

The backup power system should have enough capacity, measured in watts or volt-amperes (VA), to power both your PC and its monitor. A few minutes of backup power should give you enough time to realize what happened, evaluate the situation, and shut down your computer systematically, saving your data until you pry the penny out of the fuse box and put out the fire.

A further consideration with both standby and uninterruptible power systems is the waveform of the output; sine wave or square wave. Sine-wave current exactly matches that supplied to you by your utility. Square-wave inverters are cheaper and easier to make. However, square waves sometimes cause problems. At a given voltage level, square waves hold more energy than sine waves and can thus cause computer power supplies to overheat. Square waves are also rich in harmonics that can leak into your PC as noise. A recently developed cross between the two, called "stepped square waves," roughly simulates the shape of sine waves to avoid the possibility of overheating the computer vet is relatively inexpensive to generate.

No single backup-power system-indeed, no single power-protection devicecan claim to be the perfect match for every computer system and every situation. To find the best unit for your particular system, you should weigh each protection system's and power supply's abilities and disabilities and compare them with the precise needs of your computer.

how they react to power failures and protect your computer.

Both types of backup power systems

rely on batteries for the energy they ultimately supply to your PC. Both have builtin battery chargers that keep their energy supplies topped off and ready for whatever emergency might arise. Both convert the DC voltage stored in batteries into the AC

TAKE THE BYTE OUT OF ADVERSE VOLTAGE CONDITIONS.



It doesn't take a storm to shock your sensitive com-puter and upset the business that depends on it. Over ninety per cent of computer problems are due to power irregularities. Just the slightest surge or dip in electricity can trigger costly errors, memory loss or a complete system shutdown. And any-thing from an air conditioner kicking on to a nearby appliance starting up can disrupt your office operation.

But you and your computer can easily weather the constant and devastating onslaught of volt-age irregularities with Sola's new computer regulators—the PC 150 or PC 300. Both are PC 150/300 COMPUTER REGULATORS



UL-listed and CSA certified. And both are designed to protect computers against unwelcome AC disturbances, including brownouts, voltage surges and dips, voltage transients and transverse or common mode noise. Even the most minimal voltage variations are tightly controlled because the Sola PC 150 300 provides five per cent voltage regulation. So why not take a load off your mind, when you can take the load off your line with the PC 150 or PC 300 from Sola.

SOLA



1717 Busse Rd. Elk Grove Village, IL 60007 (312) 439-2800 Some surge suppressors offer protection against electrical damage; others, only false security. PC Magazine Labs tests 34 devices. Warning; don't learn your lesson the hard way.

SURGE SUPPRESSORS

AN OUNCE OF PREVENTION...

ost people take electricity for granted. Admit it: you just don't think about electricity very often. After all, when you buy a refigerator or a television or an air conditioner, you just plug it in and go about your business and expect the appliance to go about its. You give no thought to the quality of power provided. Ignorance is bliss.

Well, not always. While your other appliances uncomplainingly withstand the hundreds or thousands of spikes and surges your home or office receives every year, the microcomputer will not. In most situations, it is simply a matter of time before an un-

protected PC experiences problems.

THINDERSTRUCK I learned my lesson about surge protection lesson about surge protection. New York City, an area prote to thunderstorms in the fall. One day when I was working at my computer, we had a doozie, with thunderclaps following closely after the flashes of lightning. I had no surge-protection device and there was no deadline present of the my computer of the my com

Somewhere near the middle of my tuna fish sandwich. I heard the loudest thunderclap of my life. But no lights flickered, and that was the end of the storm. I went back to work as the sun came through my office window.

In the deep recesses of my mind, I felt something was wrong as I powered up. "Don't I usually see the KB counting itself up?" I shook my head. "I guess not." But as the floppy disk drive on the PC booted DOS, I felt what I expect to feel the moment before I die. There was no image on the screen. I turned the monitor off and back on, then noticed the

little green power lamp was dark.

I panicked.

I pulled the unit forward to check the plug and wall connections. They were fine. I gave a DOS CHKDSK command and could tell that it was running, but nothing appeared on the screen. I yanked the plugs, grabbed the monitor and ran into the other room, unplugged a working lamp, plugged the monitor into its socket, turned it om—death.

I went down to my IBM Product Center feeling like a you-know-what, and after the staff inspected the inside of the RGB monitor they made me feel even worse. "We don't want it," they said. "Not even for parts." An hour later I left with a new RGB under my arm and a bill for \$720 in my pocket. I was sure I was a vou-know-what by now.

POSTMONTEM. No one knows exactly what happened to my monitor. It was not turned on at the time of its death. Yes talked with counties experts, including the manufacturer's technical reps I contected during this project, and all advance a similar theory. The lightning strike induced voltage that went through the ground, into the electrical wring of my monitor. Once the spike reached the instants of the monitor, it set off an incredible charge that caused the monitor top it is marked in the caused of the monitor of the pixel monitors.

I asked all these experts the same question: Would a simple \$100-or-less surge suppressor have saved my monitor? No

one was sure. Some thought the lightning strike would have been too intense for any protection device. Others thought a good circuit design could have trapped the spike, even one as large as this one must have been. But each ventured one last thought: "I'd rather take my chances with

a good device than without one."

Care to learn that lesson again the hard way? There are plenty of other horror stories just like mine. Horror stories in which



The Datashield S85 was named an Editor's Choice for its performance in the Labs. Its construction reveals impressive workmanship.

system units die, data is erased, hard disk heads crash, chips pop their contents into an alternative universe, and more. You don't need to hear it. You need to know what to do. The cheapest and simplest answers lie in surge suppressors—devices designed to take a large incoming wave and reduce it to a ripple.

HOW THEY WORK A surge suppressor accomplishes its work with a handful of weapons: resistors, capacitors, metal oxide varistors, silicon avalanche diodes, carbon gaps, gas tubes, coaxial arrestors, and so on. Each of these devices has its own method of dealing with unwanted energy voltage, but the problem is this none of the methods by itself gives sufficient protection. What you really need is a spec-

cial circuit that combines the best features of several devices so they can enhance one another's performance.

For example, the silicon diode reacts very quickly to a spike—within picoseconds (trillionths of a second) or nanoseconds (billionths of a second)—and is used in many surge suppressors to eatch and squash the leading edge of the impulse. But although nothing is faster than the di-ode, almost everything is stronger. The di-

ode can jump to attention in no time flat, but it is weak and cannot withstand the large transient current that will follow the initial spike. Therefore, something else must be waiting just behind the diode to relieve it. Most often, this will be a MOV.

Since it is fairly small and inexpensive, the MOV, or metal oxide varistor, is the most commonly used component in surge suppression equipment. You'll find it in almost every suppression circuit design. The MOV conducts electricity only when the voltage exceeds a predetermined level, shorting out the extra voltage. The beauty of the MOV is that it is much more powerful than the diode and is fast enough to clamp most transients at a respectable level. Its drawback is that it does not act quickly enough to catch the leading edge of a spike and therefore

cannot provide adequate protection by itself. Also, it does not have the capacity to dissipate the high energy levels associated with many spikes and surges without blowing up.

A MOV, used by itself as a surpe suppressor, is not a southon—it's a senfice. The MOV is companable to a highway guard nill: it can revote the excess energy to another part of the circuit, but cannot alsor hit. Care must be taken not to crete aniother problem with revoting overvoltage on the circuit. The best you could hope for with a MOV alone is that it would reduce a spike or surge greatly before it died and that it would not cache fire.

So, you need another component behind the MOV to absorb the huge amount (continues after sidebar, "Testing Surge Supressors")

TESTING SURGE SUPPRESSORS: WHAT THE DATA MEANS

How strong a surge can a surge suppressor suppress? PC Magazine Labs sent 3and 6-kilovolt surges through each of the devices and recorded their "clamping" levels. The lower the figure, the better the protection.

All surge suppressors are not created exqual. Infect, this verity, applicable to most products, appears to be especially two of surge protectors. The PC Magazine Labs tests demonstrate incontrovertily that different surge suppressors are of varying quality and provide varying protection. In most cases, the best of them will even prevent the loss of data caused by surge-induced rebooting of your PC. The worst may be more dangerous to your equilment than no protection outs your equipment than no protection.

at all.

Of the test results given in the Benchmark Tests table, the most significant are in the column showing voltage leak-through with a 6-kilovolt surge. The numbers represent the voltage in excess of the nominal line voltage measured on the surge-protected outputs of the tested device. The higher this figure, the less

protection the device affords. To determine how much protection is actually necessary, we tested separately the three different power supplies that IBM uses in PCs-one manufactured by Zenith Electronics Corp., one by Astec. and a third of unidentifiable manufacture-by subjecting them to test surges at various voltages. When hit with a surge between 4 and 4.5 kilovolts between the high (H) and low (L) power leads, the Zenith-equipped PC rebooted. The Astec-equipped PC withstood 6-kilovolt surges between high and low without flinching, but shut off on any 2-kilovolt or greater surge between either high or low ground (G). The unknown power supply passed all tests on high to low, but on a surge to ground (from high or low or both) the power turned off when the surge exceeded 3.75 kilovolts.

REVEALING RESULTS The 384 measurements that PC Labs made on each protection device revealed that even with a known and controllable surge, the leak-through of any protection device is unpredictable. A device may limit one surge and let another identical surge pass

through nearly unattenuated.

The results given in the table reflect worst-case conditions—the maximum amount of surge leak-through at the given intensity—erring on the conservative

 Just one unobstructed surge is enough to incapacitate a computer or blow away its memory.

side. The reason that PC Labs chose to present the worst-case situations (rather than create a statistically derived average) is that there is no such thing as an average surge. Moreover, just one unobstructed surge is enough to incapacitate a computer or blow away its memory.

The results were reproduced to verify that high leakage values were not due to operator error. In all cases high leakage values—although not predictable—did

Libertypetedly, some protection devices not only allowed the full potential of a surge to leak through but also amplied it, increasing rather than reducing danger to the supposedly protected equipment. In all likelihood, the culprit in these ill-devised devices was some than of reactive most-filtering circuitry that resonated at or near the 100-kHz test Trequency and thus sharpened the pulse. Unlike the test signal, narral surges are may in fact, be broadband. However,

there is a real possibility that some frequency component of a surge may actually be intensified by such ersatz protection devices.

Two surge suppressors, the Datashield S85 and \$100, offered two degrees of "filtering" at different outlets. A full series of tests was run at each filtering level. Although the "super filtering" outlets afforded greater protection, all outlets on both devices were able to ade-

quately contain all test surges.

DEADLY NOISE. A number of devices appeared to fail customphically, utiliter becoming numerically spining first. In our cases, bowen cases, bowen cases, bowen cases, devices continued to function, reducing the intensity of volage surges. Of those that did fail, however, most rattled when shaken. We dissembled one such characteristic halomatic properties of the continued of the halomatic properties. The surge properties of the three devices is noise filtering.

Since the PC already has effective internal noise filtering, one conclusion that we can draw from the tests is that noise filtering in a surge-protection device, far from being a benefit, may in fact be a hindrance to surge protection and safety.

One device, Electronic Protection Devices' The Orange, literally spat fire (a bright electrical flash that Jumped from is outlets) during the tests. The damage occurred during the second 6-kilovolt pulse sent to the unit. The Orange reduced the intensity of the surge that caused the damage to 1.7 kilovolts, which in all likelihood would not have damaged a PC connected to it. Testing of the device was terminated at that position.

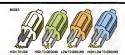
Four devices—Control Concepts' Islatrac CP-7 and Islatrac CP-15 and Electronic Specialists' Kleen-Line Spike Suppressor AC-SUP-31 and Kleen-Line

■ SURGE SUPPRESSORS



Benchmark Tests Surge Suppressors

While most of the devices PC Magazine Labs tested did a good job at suppressing a surpe, some allowed far too much voltage frough. The outlet symbols used indicate the mode where the device was weakest. See the sidebar: "Festing the Surge Suppressors: What the Data Means" for a guide to the results and "Surge Suppressors Test Procedures" for an explanation of how they were tested.



PEAK LET-THROUGH AT 6 by

RANUFACTURER MULEL	MUCE	0 KILOVOLTS	MUDE	
		0 KILOVOLTS	1	0 KILOVOLTS 2
Brooks Merketieg Corp. Surga Stoppar AT 6-6	P	0.18	4	0.25
Computer Accassories Corp. PowarLina Dna	2	0.57	P	0.62
Computer Accessories Corp. PowerLiee Strip	P	0.61	R	0.82
Control Concepts Corp. Islatrac CP-7	8.	0.98	1	a 4.86
Ceetroi Concepts Cerp. Islatres CP-15	Ø.	0.54	B	a 4.05
Certis Manufacturing Company Diamond	P	0.41	B	103
Certis Meeelecturieg Company Emerald	P	0.52	P	0.92
Curtis Manutecterieg Company Ruby	P	0.62	P	1.67
Curtts Manutacturing Company SAFE-Strip	B	0.63	63	SII .
Curtis Manulecturing Company Sepphire	4	14	2 8	1.54
Dynatech Computer Power Serge Seetry DSF	8	0,65	D	0.97
Dynetech Computer Powar Serge Seetry SS4	P	0.46	P	0.76
Dyeelech Compuler Power Surga Santry SS6	P	0.48	P	0.94
Dynatech Computer Power SSC System Controller	Ø.	0.35	P	0.62
Electronic Protection Devices EC-II	P	0.55	P	0.76
Electronic Protection Davices EC-IV	P	158	2 8	12
Elactronic Protection Davices The Lemoe	B	0.54	R	0.85

a—Device apparently falled without indication during test. b—High-filtering section. c—Standard-filtering section. d—Super-filtering section.
g—Probable only H to L protection.

MANUFACTURER/MODEL	HODE	YEAK LEAK-THROUGH AT 3 kV	MODE	PEAK LEAK-THROUGH AT 8 kV
		KILOVOLTS	1	0 KILOVOLTS 2
Electronic Protection Devices The Drange	8 1	192	D.	171
Floctronic Specialists Kisen-Lina Spika Suppressor	1	0.35	Ba	237
Finctronic Specialists Klaan-Line Supar Filter Spike Supresso	2	0.27	4 .	6.46
Kenzington Microware Micro Saver	P g	0.87	B g	4.79
Kansington Microwara PC Saver	8	0.34	60	5.44
LEA Dynatsch KloanLina MB-10	8	0.06	B	.0.62
LEA Dynatech Surga Eliminator	1	0.05	4	0.17
Pasamax Talo MAX	1	0.48	P	0.75
Panamex MAX 2	2	0.5	EP)	0.63
Panamax MAX 6	2	0.54	4	0.64
Para Systems Clean Power 1200	2	1.09	P	9.74
Perma Power Electronics RS-619 Sockets Plus	1	0.36	P	0.5
Power Integrity Corp. ZTAP	2	3,41	2 8	3.47
PTI Industries Datashield Model 75	4	0.72	B	1.04
PTI Industrias Datashield Model 110 AMS	P	3.41	1	252
PTI Industries Detashleid S85	P b	0.15	A b	0.29
PTI Industries Datashleid SBS	@ c	0.45	A .	0.52
PTI Industrias Datashield \$100	A d	0.15	Sp d	0.68
PTI Industries Datashield \$100	1 c	0.37	100	0.78

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2 Kleen-Line Spike Suppressor AC-SUP-31 Electronic Specialists Inc 171 South Main St.

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12516 Lakeland Rd. Santa Fe Springs, CA 90670 (213) 944-0916 List Price: \$209.00 CIRCLE 647 ON READER SERVICE CARD

5 Surge Eliminator LEA Dynatech Inc. 12516 Lakeland Rd. Santa Fe Springs, CA 90670 (213) 944-0916 List Price: \$109.00 CROLE 634 ON READER SERVICE CARD

1840 Pembroke Rd. Greensboro, NC 27429 (919) 379-9773 List Price: \$175.00 CRICLE 625 ON READER SERVICE CARD ("Testing Surge Suppressors" continued)

Super Filter/Spike Suppressor AC-SFK-36S-apparently stopped functioning without showing any external sign of damage, and only one, the Kleen-Line Spike Suppressor AC-SUP-31, gave any indication that it no longer protected the PC from surges. Such failures without indication are perhaps the most dangerous: although the system these devices are connected to might seem to be protected, it would be vulnerable to the next surge.

The other test results graphically represented in the Benchmark Tests table document the conditions under which we made the worst-case measurement.

Surges can occur in any of four modes: between the two leads normally used for powering equipment-the socalled high (or hot) and low (common or neutral)-and between ground and either or both of the other leads. The table indicates in which mode the worst-case leakthrough occurred. All modes hold potential danger for PCs.

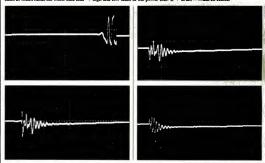
Several devices functioned well in normal-mode surge suppression, but not when the surge appeared between ground and the common (neutral or low) side of the power line. Although the common lead may nominally be considered ground, it is not the same thing. Often substantial voltage differences may exist between common and ground, and voltage surges are not unusual between the two. Such surges are among the most difficult to protect inside equipment against, and so such protection is indeed desirable. Note that PCs equipped with the Astec power supply are particularly vulnerable to surges that occur between the power leads and ground.

One device, the Micro Saver from Kensington Microware, apparently provides surge protection only between the high and low sides of the power line. It

showed almost no suppression of surges relative to ground.

We didn't run the full series of tests on one device. Dynatech Computer Power's Surge Sentry SS6's status indicator. which was supposed to change color from green to red upon failure, stopped glowing altogether about halfway through the procedure. The surge that caused the failure did not leak through.

You should not rely on the numerical data for an absolute ranking of the tested devices; we tested only a small sample, and, inevitably, individual units, even from the same production run, will differ. In other words, a unit with a .34-kilovolt leak-through is not twice as good as one with a .68-kilovolt leak-through, or necessarily even better. However, a clear line can be drawn between those devices that effectively limited surges and those that offered marginal protection or none at all .-- Winn L. Rosch



A suppressed surge: These photos of an oscilloscope screen were taken during the PC Magazine Labs test procedure. The four photos are representative of the 34 devices tested and show the voltage passing through to the PC after the surge was clamped.

nents, the gas discharge tube is capable of reducing powerful impulses to a size that computer equipment can handle. Unfortunately, the tube is very slow to react and very slow to "cool off," so by itself it too is ineffective.

There is another consideration with the pellet and gas discharge tube arrestors: if the device is triggered by an impulse of short duration, say less than a millisecond, the arrestor may short-circuit the line for as long as three quarters of a cycle, creating a transient that is larger than the transient it nipped in the bud. This phenomenon may explain why some of the ring waves we sent into the devices while testing them in PC Magazine Labs came through even larger than the original waves.

The better surge suppressors The Orn on the market use a circuit that our tests combines the best elements of these and other components. You need something superfast to grab the first sin-pulse. You need something superfast to grab the first sin-pulse. You need something reasonably fast and powerful to reroute and deal with the majority of the overvoltage. And you need something extremely powerful to absorb the buge impulses associated with lightning strikes and utility switching.

A GOOD RULE OF THUMB All surge suppressors have what is called a "clamping level," which is indicated by the maximum voltage the unit is supposed to let through, but these levels differ. Some manufacturers will figure that 400 volts. Most experts agree that it's OK to let through about 100 volts at short pulses. (A sustained 300-volt level for more than a fraction of a second would reduce any PC

to garbage.) So a device that clamps spikes to less than 300 volts is doing its job. Think of it this way: the lower the actual

clamping level, the better the protection.
Unfortunately, there are very few standards in this business, largely because no one knows the quality of electrical power and the problems associated with it for a given customer. Even Underwriters Laboratories admits the difficulty in testing



The Orange from Electronic Protection Devices did not fare well in our tests, spitting flames at 6 kV. Shown here is the burnt-out unit.

surge suppressors; all it can do is certify a unit clamps spikes at the claimed level.

Surveys demostrate wide differences in the quality of commercial power. If power were a constant throughout the country, manufacturers could deep control, and control and control and country and control and country and control and country and cou

PC Magazine Labs tested 34 surge suppressors. The accompanying features table and benchmark test results tell the story for each individual device. They come in so many sizes, shapes, and flavors that the most helpful categorization of these devices is the number of outlets they have.

SINGLE-OUTLET DEVICES

The surge protector with a single power outlet is designed to protect one piece of equipment, usually the system unit. It usually consists of a heavy-duty extension

> cord with the device in the middle and will have no on/off switch, so there is nothing extra to power up before you turn on your system unit. Most are designed with a power indicator light.

The idea, of course, is simplicity of installation and operation. Once you plug it in, you can forget about it. Most are not built for beauty, however, but as the kind of thing you break your toe on underneath the desk.

One unit we tested was rather stylish, however. Called the Stylish, respectively. Called the Called Saver, it replaces rather than adds on to the normal PC power cord. Its small, unobtrusive rectangular LED lets you know in the power is on. The protection unit is positioned about 12 income about 12 in

The purpose of the PC Saver—and other single-outlet surge suppressors—is two-fold. First, it is designed to filter spikes and surges coming from the wall outlet and clip them. Its circuit consists of a combination of diodes, resistors, two line filters, two MOVs, and a coaxial arrestor, all neatly packed onto a board inside a box no larger

than a medium-size mouse. The company claims that its single-outlet system has an added advantage because it will keep surges from other peripherals from traveling up a common power bar and reaching the PC. This is a valid comcern. Let's say you bay a six-outlet power strip and plug everything you own into it. Let's also say you have an electrical problem with one of your peripherals, and it sends an impulse back through the power

strip and into your computer. The PC Sav-

SURGE SUPPRESSORS TEST PROCEDURE

PC Magazine Labs had to generate artificial lightning to give the surge suppressors a chance to prove their mettle.

To test surge suppressors, you need surges. Naturally occurring surges in the power net are too unpredictable and uncontrollable to allow objective evaluation of competing products. The most widely accepted test signal—in effect an artificial surge—used for evaluating the ability of electronic equipment to

withstand surges is the Institute of Electrical and Electronics Engineers' Standard 587-1980. For these tests, PC Magazine Labs used a simulated surge closely adhering to that standard

The standard calls for different test surges for equipment designed for different wiring environments or categories. By definition under IEEE Standard 587, a Category A wiring environment is a duplex outlet with a wire run of more than 35 feet from the service entrance (where electrical service enters a building) or a circuit-breaker panel. Category B environments are short-branch circuits. distinguished by their closer electrical proximity to the service entrance or breaker panel. The surge dangers in Category A environments are inherently

A environments are inherently Prossoral less severe because the capacitive and resistive effects of normal household, commercial, and business wire circuits tend to reduce the intensity of surges. Nearly all realistic PC installations involve Category A wiring.

A KeyTek Instrument Corp. model 711 Surge Generator/Monitor was used to synthesize a 100 kilohertz ring wave with a ½ microsecond rise time, as per the IEEE 587 Category A standard. We coupled this test signal into the surge-suppression devices through a KeyTek model F31 Surge CouplerFilter. The

F31 also served as a back-filter that prevented the simulated surges from entering the test equipment (and building wiring generally) and causing real damage. No load was applied to the device undergoing tests because previous tests had shown that loads had no measurable ef-

nt to I fect on the efficacy of surge suppressors. I nomina

PC Magazine Labs technician Charles Rodriguez braved shocks, explosions, and shrapnel to put the devices through their paces.

To protect the test technicians from possible explosion and shrapnel, we isolated the tested device in a safety shroud improvised from a printer sound-suppressing case.

We tested all surge suppressors at two voltage levels, 3 kilovolts and 6 kilovolts, both with an instantaneous current of 500 amperes.

Initially, we planned to conform the test exactly to the IEEE Standard 587-1980 Category A, which specifies a test voltage of 6 kilovelts at 200 amoures. In preliminary trials, however, that current proved inadequate to distinguish among protection levels offered by various devices. We therefore chose higher current, the limit of the test equipment.

Testing beyond 6 kilovolts was not necessary because that potential is the nominal flashover point of the duplex outlets to which most PCs are

connected. The outlet itself thus serves at the ultimate surge suppressor (although one inadequate to fully protect a PC).

One technician, Charles Rodriguez made all the measurements so as to avoid any inconsistency in test procedure. He conducted all tests of all units in the same order. First, each unit was subjected to a 3-kilovolt negative-going ring wave synchronized to four different phase angles of the current supply; 0, 90, 180, and 270 degrees. Three measurements were made at each phase angle to assure consistency. Next, the polarity of the ring waves was reversed (to positive-going), and the measurements repeated. The potential was then increased to 6 kilovolts and all measurements repeated.

He repeated the entire sequence of measurements four times, once for each of four surge modes: normal mode, high to low, common mode, high to ground; accommon mode, low to ground; and common mode, high and low to ground. A total of 384 measurements was made for each device that surments was made for each device that surments was made for each device that surveits was made to the surtivation of the surseries of the surtivation of the surseries of the su

-Winn L. Rosch



SURGE SUPPRESSORS

Surge Suppressors:

Electronic Protection Devices

Suppressor Electronic Specialists Kleen-Line Super Filter Spike

The Orange Electronic Specialists Kleen-Line Spike \$99.90 Circuit breaker, 15 A

\$35.95 None

\$84.95 None

Manufacturer ·	Price	Overload protection	Mumber of outlets	Outlets switched/ unswitched	Power lamp	Unit states indicator	Low- voltage sensing	Power cable length	UL listed	Plugs in/ mounts on
Brooks Marketing Corp. Surge Stopper AT 6-6	\$114.95	Unlabeled circuit breaker	6	6/0	Yes	Yes	No	6 ft.	Yes	Wall/floor
Computer Accesories Corp. CowerLine One	\$49.95	None	1	0/1	Yes	Yes	No	-	Yes	Wall/floor
Computer Accessories Corp. PowerLine Strip	\$79.95	Circuit breaker, 15 A	6	6/0	Yes	Yes	Yes	6 ft.	Yes	Wall/floor
Control Concepts Corp. slatrac CP-7	\$139.95	Circuit breaker, 8 A	4	0/4	No	No	Yes	5 ft.	No	Floor
Control Concepts Corp. siatrac CP-15	\$249.95	Circuit breaker, 15 A	6	0/6	No	No	Yes	6 ft.	No	Floor
Curtis Manufacturing Company	\$49.95	None	6	3/3	Yes	Yes	No	-	No	Outlet
Curtis Manufacturing Company merald	\$59.95	Unlabeled circuit breaker	6	6/0	Yes	Yes	No	6 ft.	No	Wall
Curtis Manufacturing Company Buby	\$89.95	Unlabeled circuit breaker	6	6/0	Yes	Yes	No	6 ft.	No	Wall
Curtls Manufacturing Company SAFE-Strip	\$29.95	Fuse, 15 A	6	4/2	Yes	Yes	No	7 ft.	No	Wall/floor
Curtis Manufacturing Company Sapphire	\$79.95	None	3	3/0	Yes	Yes	No	-	No	Outlet
Dynatech Computer Power Surge Sentry DSF	\$119.95	None	4	4/0	Yes	Yes	Yes	5 ft.	Yes	Floor
Dynatech Computer Power Surge Sentry SS4	\$79.95	Unlabeled circuit breaker	4	4/0	Yes	Yes	No	5 ft.	No	Floor
Dynatech Computer Power Surge Sentry SS6	\$89.95	None	6	6/0	Yes	Yes	No	5 ft.	Yes	Floor
Dynatech Computer Power SSC System Controller	\$139.95	None	4	4/0	Yes	Yes	Yes	5 ft.	Yes	Floor
Electronic Protection Devices	\$69.90	Circuit breaker, 15 A	6	0/6	Yes	Yes	No	6 ft.	No	Wall/floor
Electronic Protection Devices	\$59.90	None	3	0/3	Yes	Yes	No	_	No	Outlet
Electronic Protection Devices	\$44.90	None	6	0/6	Yes	Yes	No	_	No	Outlet

0/6

Wall/floor

Floor

6 ft.

3 ft.

Yes

Yes

Manufacturer Model	Price	Overload protection	Number of outlets	Outlets switched/ unswitched	Power lamp	Unit status Indicator	Low- voltage sensing	Power cable length	UL listed	Plugs in/ mounts on
Kensington Microwara Micro Saver	\$69.95	Fuse, 8 A	4	4/0	Yes	No	No	9 ft.	Yes	Wall/floor
Kensington Microware PC Saver	\$49.95	None	1	0/1	Yes	Yes	No	8 ft.	Yes	PC
LEA Dynatech KleanLing MB-10	\$209.00	Fuse, 10 A	1	0/1	Yes	Yes	No	6 ft.	No	Floor
LEA Dynatech Surge Eliminator	\$109.00	None	1	0/1	Yes	Yes	No	6 ft.	No	Floor
Panamax TaleMAX	\$89.00	Fuse, 4 A	1	0/1	Yes	Yes	No	-	Yes	Outlet
Panemex MAX 2	\$79.00	Fuse, 4 A	2	0/2	Yes	Yes	No	-	Yes	Outlet
Panamax MAX 6	\$99.00	Fuse, 4 A	6	6/0	Yes	Yes	No	6 ft.	Yes	Floor
Para Systems Clean Power 1200	\$49.95	Fuse, 10 A	4	40	Yes	Yes	No	6 ft.	No	Wall/floor
Perma Power Electronics RS-610 Sockets Plus	\$79.95	Unlabeled circuit breaker	6	6/0	Yes	Yes	No	6 ft.	Yes	Wall/floor
Power Integrity Corp. ZTAP	\$175.00	Fuse, 15 A	• 1	0/1	No	Yes	No	-	Yes	Outlet
PTI Industries Datashield Model 75	\$69.95	Fuse, 10 A	4	4/0	No	No	No	6 ft.	No	Wall/floor
PTI Industries Datashield Model 110	\$119.50	Fuse, 10 A	6	0/6	Yesi	Yes	No	5 ft.	No	Wall/floor
PTI Industries Datashield S85	\$89.95	Circuit breaker, 10 A	6	6/0	Yes	Yes	Yes	6 ft.	No	Wall/floor
PTI Industries Datashield S100	\$99.95	Circuit breaker, 10 A	6	6/0	Yes	Yes	Yes	6 ft.	No	Wall/floor

er is designed to prevent this, even though it shares the strip with other equipment.

One of our biggest surprises in the testing came from a unit called the PowerLine One. It is a single-outlet surge-protection device, only slightly more than an inch on each side, with a small LED to let you know its protection circuits are working. We laughed as we hooked it up to the Keyret surge generator, we were feeling a bit sadistic after hours of testing and wanted to blow up a wimpy device for diversion. But

check out the test results of PowerLine One. It goes to show you that size isn't ev-

One. If goes to show you that size isn't everything, because we just couldn't faze it. For a single peripheral or computer unit in need of surge protection, we can recommend this lilliputian device.

The single-outlet Kleen-Line Spike Suppressor AC-SUP-31 produced excellent results through the first half of the tests, clamping 6-kV spikes down to as low as 60 volts. Then, poof—the unit croaked. We were not impressed.

TWO- AND THREE-OUTLET DEVICES

Although the convenience of four or six outlets is a handy feature in a surge suppressor, many people probably don't need to protect more than their system unit and monitor and possibly the modern, too. These people will find that you can get just as good a device with two or three outlets as the ones with four or six, and it's less expensive. The larger size of the extra outlet

Jumping joysticks, key

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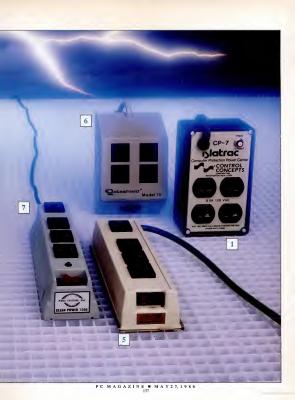
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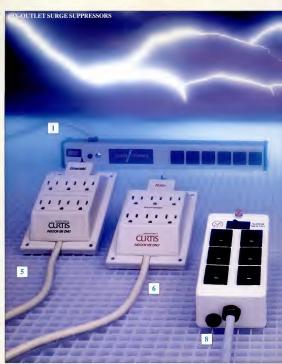
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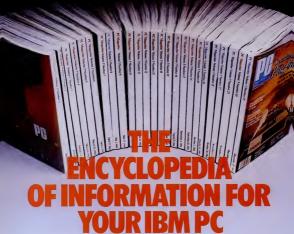












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models does not mean larger or better surge-protection devices.

The MAX 2 from Panamax also clamped very well during testing. Its design is small and simple. The MAX 2 plugs directly into the wall and has a constant power light. A replaceable fuse is located on the top. Two receptacles are on the front. That's it. No muss, no fuss, no big deal, and good spike charming. too.

FOUR-OUTLET DEVICES

Despite the fact that four outlets are sufficient in most situations, the majority of users go for six. Why? If you don't need more than four outlets, you can find excellent designs and protection with these devices. They come in many forms—strips for the floor, models that plug directly into the wall outlet, and handsome boxes that attach to the wall.

The boxes have an advantage if you're the kind of person who might go home at night leaving the power to the printer on. You can mount this type of surge suppressor, with its visible power and status lamps, where you won't miss it on your way out.

One of the nicest units in this category is the Surge Sentry DSF from Dynatech. The device uses Dynatech's patented Surge Sentry circuit, which cossists of a three-stage arrangement. First in line is a silicon diode that reacts within 5 piconsection of the properties of the propert

overvoltage. The DSF also contains a brownout/blackout sensor that shuts off the unit and your PC until the reset button is pressed. This is a feature to look for in all surge suppressors because you can get a worse surge when the power is restored than when it dropped out. The Surge Sen-



The Datashield S85 and Datashield S100 from PTI Industries impressed the PC Magazine Labs staff with both their surge-suppressing abilities and their solid construction. Although two levels of protection are offered on each—standard and super filtering—all outlets provided more than adequate protection.

The Panamax MAX 2, a twinoutlet device, did a surprisingly good job despite its tiny size. Its companion, the MAX 6 power strip, was equally effective in limiting the most severe surges thrown at it.

One of the nicer units was the Surge Sentry DSF from Dynatech. It offers more features than many of the units and fared extremely well in our testing.

Any of these five should do yeoman service in warding off the evils of all but a direct lightning hit.

try DSF has a power indicator lamp, a surge-protection status indicator lamp, an on/off switch for all four outlets, and a reset button. The unit did very well in our testing.

Two surge-suppression devices that didn't do very well in our tests were the Micro Saver from Kensington Microware and the Clean Power 1200 from Para Systems. Both are short power strips with four outles, and both ocnain rather unsophisticated surge-suppression devices. The Micro Saver uses a coaxial arrestor, one MOV, and two line filters. Check the test results for vounself.

The Para Systems Clean Power 1200's circuit is small, consisting of no more than half-a-dozen components, including one MOV, one resistor, one capacitor, and what appear to be silicon avalanche diodes

on a board the size of a Saltine cracker. A coil attached to the board was charred on one side, apparently the result of arcing. At one point during our tests, in fact, a small puff of smoke came through the device's receptacles. The power box itself mass one of its four outless offset for a transformer pack, and it does have a status indicated that it is a small puff of the device's receptacles. The power box itself cannot be a small puff of small puff of the device of the device of the small puff of the small p

SIX-OUTLET DEVICES

It seems the more outlets on the device, the more devices there are to choose from, and we looked at 17 in this category, ranging in size and shape from boxes to power bars. The obvious feature most users are looking for in the six-outlet sarge protector is the number of outlets. But beware any device has a maximum ratting, and you should never exceed it. So If you were thinking of computers, so most one of the properties of computers, so most one of the properties of the properties. It is not the properties of the that happen to be located close together, forget it.

Some of the six-outlet strips were designed to sit on the floor out of sight, but the majority can also be attached either to the wall or to the underside of a desk. This is an obvious convenience if the unit contains an onvoff, reset, or alarm switch, or if it contains power and protection status indicator lights. Otherwise, it doesn't make much difference whether it can be mounted or not.

could be resized some very nice touches on the Datashield series from PTI Industries. The model S100, for example, has a low-voltage lamp and an audio alarm circuit to alert you of a pending brownout when the voltage disp about 102 volts. In the event of a blackout, the unit shus itself off and must be resistated by pressing the reset butween the contract of the pression of the reset butween the contract of the pression of the reset butween the contract of the pression of the reset butween the contract of the pression of the reset butween the contract of the pression of the reset butween the contract of the pression of the pressio

ply, several noise filters, four MOVs, and two coaxial arrestors. However, the replaceable fuse on the model S100 is located inside the unit—a poor choice. The model S85 trades the audio alarm and

switch on the S100 for an on/off power switch that shuts down all six sockets, which is a feature missing on the S100.

Two of the power bars we tested, Curtis's SAFE-Strip and Computer Accesso-

ries' PowerLine Strip, are constructed of liminsy plastic and fairly unsophisticated surge-suppression mechanisms and electronic components. The SAFE-Strip contonic components are surgested to the Safetonic components and the surgested and the LED, and a load resistor for the LED—on unch protection. The PowerLine Strip contains a bit more: two line filters, three MOVs, an audio later circuit/speaker, a bridge recrifter, and a soldered fuse. That state time will make what should be a simlata time will make what should be a similar time will make the should be a similar time will be a similar time will be a some should be a similar time will be a some should be a similar time will be a simi

Two heavy-duty power bars we tested feature both sturdy construction and multiple-stage surge protection, and they would

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fication during input, screen inquity of wendor activity, printed wendor history at wear end.

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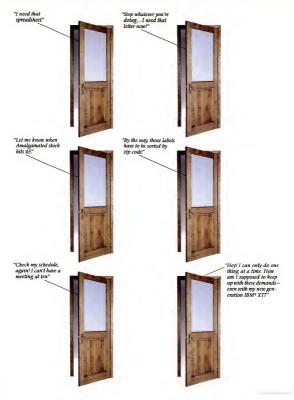
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be my choices in a power bar. The Surge Stopper AT 6-6 from Brooks Marketing and RS-610 Sockets Plus from Perma Power have excellent suppression, and their construction is rugged.

CONCLUSION The bottom line on surge-suppression devices is this; you can not monitor the performance of a surge suppressor in use because you never know when the surges come nor how strong they are. So don't buy the one that matches the color of your office, nor the one that locks well built, nor the one that offers the greatest number of outlets and gadgetry, nor the least expressive.

Think of your needs, but don't exceed them. If you only need two outlets, don't bother getting four or six. Study the results of our PC Labs testing thoroughly. Find units that clamp spikes at reasonable levels. Read the manufacturer's specs carefully. Then make your decision. It's one your PC will either live or die with. [2]

Phil Wiswell is a frequent contributor to PC Magazine.



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TELEX 51060 14525 (714) 581-6770 ENGINEERING ADVANCED COMPUTERS

BR AVE MDBS claims to have taken PCbased expert systems to a new level by combining "knowledge engineering" with business applications, Caution: Steep

learning curve ahead.

ook around you. Is there a task in your daily business that you perform fairly regularly? Is the task complex but systematic? Is it the sort of responsibility you always figured you could train an assistant to handle? Perhaps your job requires that you work out complex delivery routes, evaluate dozens of job applicants, set quotas for 40 sales people, evaluate credit applications, or select equipment for internal use.

If any of these business chores sound familiar, it's time to inform yourself about expertsystem shells, the next wave in practical business application software. Expert-system shells bring computer power, speed, and consistency to bear on many tasks that depend on the application of both knowledge and insight, rather than on the relatively simple mechanical manipulation of hard data.

Last year, PC Magazine reviewed the first

few of these programs available (see "Artificial Expertise: Intelligent Software for Problem Solving," PC Magazine, Volume 4 Number 8), identifying seven programs, ranging from \$300 EXSYS to \$10,000 mainframe-descended M.1. Now, there are at least twice as many expert-system shells available for the personal computer, and the bottom end of the price scale has dropped to \$49.95 (MicroExpert, from the Professional and Reference Division of McGraw-Hill Inc. in New York City). List prices of several of the more sophisticated systems have been reduced substantially. And for the first time, a company with substantial PC business software roots, Micro Data Base Systems (MDBS) of Lafavette, In-

SYSTEM?

diana, has introduced a tightly integrated program that includes the five standard business microcomputing functions (database management, word processing, spreadsheet, graphics, and communications), as well as the expert-system shell. The new product, Guru, is possibly the most versatile, practical tool available today for building usable expert systems.

MAINFRAME HISTORY Expert systems store and manipulate human expertise and are usually used to answer questions or give advice in a way that mimics the human reasoning process. Expert-system "shells" (or expert-system development tools) are programs that build and use expert systems in the same way that database management systems build and use

databases. Like a DBMS, an expert-system shell is a general-purpose tool: the same shell can be used to create many different, unrelated expert systems, which are stored as disk files exactly as databases are. As with database management software, you get at the expert systems you have built by first executing the expert-system shell program, and within it, invoking a particular expert system.

The first expert systems, which were mainframe-based research tools, were not built using shells. They were built from scratch, typically using the LISP programming language, and usually at universities. MYCIN, for instance, a system developed at Stanford, diagnoses bacteriological blood infections. DENDRAL helps analyze unidentified chemical compounds. Schlumberger Ltd., the giant French oil field services company, developed an expert system called Dinmeter Adviser to help it locate oil deposits by analyzing geological readings. Carnegie Mellon University built R1 in conjunction with Digital Equipment Corp., which uses the system (under the name XCON) to configure every VAX computer that goes out the door.

GURU: SUMMARY OF FEATURES

- Expert-system features Driven by if-then rules
- Maximum rule set: about 1.600 rules
- Rules must be abstracted to expressions involving variables ■ Multivalued variables with certainty factors ("fuzzy" variables)
- Complex premise (IF) expressions
- Rule conclusion (THEN) can be any collection of Guru commands
- Rule sets interact effectively with other program features ■ WHY and HOW logic-tracing functions
- Rule sets can call other rule sets
- Tight control over reasoning process if desired

Standard business computing features

- Databases hold up to 2 billion or more records
- Maximum database record and field size: 64K bytes
- Maximum fields per database record: 255
- SOL-like inquiry and statistics
- Multiple database inquiries in a single command
- 256-row by 256-column spreadsheet
- 15 different types of graphs
- Reasonable general-purpose text processing ■ Text files up to 10,000 lines
- Full set of communications commands
- Tight integration among functions

Programming language ■ Full range of control structures

- Single program can call on any of the business functions or expert-system rule sets
- Over 50 built-in numeric, string, logical functions ■ Supports arrays
- Supports local and global variables
- Burdensomely detailed control over program environment
- User interface

- Menu and command interfaces not tightly interwoven ■ Weak natural-language interface
- Custom screens for both input and output

Documentation

- Good reference manuals
- Poor user guide (beginner manual) ■ No tutorial manual





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for a single copy. Site license and multicopy discounts available. Requires: 512K RAM, hard disk with at least 2 Mbytes free, DOS 2.0 or later. Versions available for Novell, 3Com, and IBM PC LANS. In Short: A buse program integrating a

solid, but complex and often bewildering. expert-system shell with traditional business applientions (database, spreadsheet, word processing, graphics, and communications) and a weak naturallanguage interface. A system develope tool rather than an end-user program. Gura

may encourage easy and casual use of expert-system techniques in everyday business environment

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Although on-screen integration is weak, the different parts of Guru are lightly integroted from o programming point of view, and all can make use of the expert-system features. A rule set con include an initialization sequence that is performed before the rules are exercised. The commands shown here create or working database using the multime CONVERT statement. The variable E. CF controls the type of file that CONVERT will create — ASCIL 115: F. Gurut database.

THE KNOWLEDGE BASE AND THE MFRENCE EVENINE As expert systems evolved, it became clear that each has two moner-of-less-separable parts. There is the base of knowledge specific to the field of expertise of the system. And then there is the collection of processing processes, used for deriving conclusions from transferable to other areas of expertise with minimal change. These procedures came to be called the system's "inference engine."

From this insight, the expert-system shell was born, and since then, every expert-system shell has consisted of an inference engine plus some facilities for building and managing a knowledge base specific to the expertise that the system captures.

When business and the professions began to embrace personal computers, expert systems began moving out of the universities and from mainframes to minis and micros. And as they develop, it is becoming apparent that the old mainframe terminology, though we are probably stuck with it, is a bit misleading.

The "expert" in expert system might lead you to believe that these programs are useful only if they incorporate the knowledge of someone who knows more about a field than you do, and indeed, the original

expert systems, like MYCIN, were designed to accumulate the knowledge of frue experts. But the same software technology could incorporate, for example, the knowledge of a sales manager who has worked out

sales manager who has worked out methods of setting quotas. Another system might be used to do preliminary and straightforward evaluation of test scores of job applicants,

of job applicants, to function as an assistant to a personnel officer. Systems like this are "non-expert" expert systems, sometimes referred to as "assistant" and "colleague" systems. They are potentially useful and considerably less difficult to build than

systems meant to do extremely specialized and esoteric tasks.

Although there are expert systems that use other schemes, Guru and most of the other programs available to personal com-

The last full full field from the full field from t

Building an expert system in Guru is o process of specifying if-then rules that express the knowledge of the human expert whose reasoning is being intuited. Rules can be created and edited in the test processing function or using the interactive rule-editing screen shown here. You can move from box to box using the Pgly and PgD nkeys, and the baxes scred if necessary to accept lengthy test. The IF and THEN boxes comoin the



MBDS's Gura includes an excellent, full-featured database as one of the five standard batters applications integrated with the Expert-system shell. It shares most of these features with MDBS's KnowledgeMan. The books on the left trace the series of ment schoics; each choice is moved to the top of its box, and another overlapping box appears. Menus can even be used to assemble multidatabase agenties.

puters represent knowledge as sets of ifthe rules: "If the cost of one flight is lower than the cost of another, then pick the lowest-cost flight", "if a passenger likes United Airlines, then the preferred flight is one using United." ("These two examples, and most of the others you will encounter in this article, come from PC Magazine's sample scenario. See sidebar "New Job Title: Knowledge Engineer.")



MDBS claims that Guri: anawal-language interface will accept ordhary English phrases and sentences. but its ability to deciphed language is extremely limited, making this interface the weakest link in the product. When Guru doesn't understand aquery, it comes back with its own question (as shown), but if you don't know the proper names of the available fields, you're out of luck.

There are several advantages to using a computerized expert system to manipulate business or industrial knowledge:

- In many tasks that require knowledge and reasoning, the reasoning is repetitive and the whole task numbingly boring. A computer loaded with the set of rules that constitute the knowledge required will process them over and over without complaint. For example, an expert system could be programmed to set quotas for 100 salespeople, a task in which the reasoning used to determine the quota is the same for each person.
- A computerized knowledge base can continue growing, essentially forever, and can accumulate knowledge from any number of different human sources. Most knowledge bases start with a couple of dozen rules related to a subsert of a general problem, and then grow and evolve as more and more rules are toaded into them. more and rules are toaded into them, and then grow and evolve as the contract of the contract
- Computerized assistants, colleagues, or experts are always consistent. They never forget a rule or commit a simple oversight. They never go on vacation or get sick.
 - Computerized knowledge bases can



Besides rules, initialization, and finalization sequences, rule sets in Gum can include variable definitions like this one for BESTPRIC. The FIND box in this screen contains any set of Garu commands necessary to set the value of BESTPRIC. In feequently, a prompt to the user to supply a value. In this case, BESTPRIC is identified by PERFORMing the Guru program called LOADBEST, which is searches a database.

be reproduced accurately and quickly, just by copying a few floppy disks, so that their expertise is readily available to anyone who needs it.

- Because the expertise can be replicated, it can also be sold. Although the market in expert systems does not yet exist, as the development tools become more
- The people who work directly with *Guru* will be programmers and other

computer pros, not personnel managers.

common, it is reasonable to expect that a number of products will emerge. Perhaps ads like "Buy yourself the best travel adviser in Chicago" will appear within a few years.

In anticipation of a new business marker for expert systems and increased interest in the commercial exchange of expertise, MDBS introduced Guru, a \$2,995 program that incorporates an expert-sysem shell, the five standard business anniications, and a natural-language interface in a single, very complex, but solidly engineered package.

MDBs is best known for Knowledge-Mn, a powerful database management system with a significant following. For a few months back in 1983, it looked as if KMan might be a serious viral to dBASE (I), widely recognized as the industry leader. But the program, though very powerla, suffered from complexity and from difficult-to-understand manuals. Never programs like R-base 5000 have established thermed ves as the real rivals to cant market among professional programmers and system developers. Now. MDBs is intimise is bose on Guru.

tures with the latest version of Knowledge-Man. It has an excellent, full-featured database function and small but useful spreadsheet, communications, word processing, and graphics features, as well as a complete programming language. Programs and databases developed in KMan can be moved to Guru very easily.

Guru shares most of its business fea-

Like KnowledgeMan, Guru is a system developer's tool, not an end-user system. The people who work directly with Guru will be programmers and other computer pros, not personnel managers and travel advisers. These programmers will, of

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course, use Guru to build applications that will be used by those without computer backgrounds, and Guru gives the programmer all the tools necessary to create truly powerful and simple-to-use applications. MDBS is clearly marketing Guru as an application development tool by pricing the full developer's version at nearly \$3,000 and selling a run-time version for only \$300.

From the application builder's point of view, the different parts of Guru are tightly integrated. Parts of databases can be moved into the spreadsheet easily, text files can extract information from spreadsheets or databases, and a spreadsheet cell can be defined by any collection of Guru commands, such as a database extraction or statistical function. Programmers have all the standard functions at their fingertips simultaneously and interchangeably and can call on the expert-system features as desired to calculate a spreadsheet cell's value, to choose a paragraph for inclusion in a form letter, or to select a record from a database. Guru's full programming language includes familiar WHILE-DO. TEST-CASE, and IF-THEN-ELSE control structures and allows programs to call one another, with parameters if desired and with explicit control over local and global variables

Both Guru and KnowledgeMan use upwards of 100 cryptic "environment variables" that give the programmer who thoroughly masters them extremely tight control over Guru's behavior. For example, they allow you to define whether or not you want the screen output printed or to specify the protocol for modem file transfers. The problem with this approach is its obscurity: the meaning of the Guru command LET E.OPRN = TRUE is considerably less obvious than the equivalent dBASE III command, SET PRINT ON.

Spreadsheet cells are addressed using column-letter, row-number designation (for example, C5 is the fifth cell down the third column). Programs can refer to spreadsheet cells as if they were ordinary variables, and the spreadsheet can also be treated as an array, in which cell C5 is referred to as # (3,5). Such all-numeric references, in which the number can be replaced with a variable, make it easy for a program to cycle through any area of the spreadsheet using WHILE-DO loops.

Guru offers four different interfaces: a command interface (at the GURU> prompt, you enter any command for immediate execution); a reasonably complete menu interface; a natural-language interface; and user-defined input and output screens. The tree-structured menus are well-enough designed that an intelligent novice could, with a little practice, formulate ad hoc database inquiries or get into a spreadsheet or begin text processing. The command equivalent to a sequence of menu choices always appears on the screen before the program executes them. which is supposed to educate you over time and free you from the tyranny of the menu. However, since switching from the menu to the command interface is tedious, tegrated business applications. What's

most users will probably choose the interface appropriate to the task, rather than graduate from one to the other.

MDBS's natural-language interface is supposed to make it possible to operate Guru using ordinary English phrases and sentences. Natural language seems to be the rage these days, if you look at the advertisements and promotions for O&A and other products. This one is inadequate and won't be of much use to anyone. There's nothing natural about it. Its ability to decipher ordinary English queries is very limited, and when it needs a definition of a new word, it requests the information in a fashion that is far too obscure for any novice to work with.

There's much more to Guru than the in-

FOR MORE INFORMATION...

Almost everyone is a beginner when it comes to the practical business application of expert systems on a PC. But help is available in several forms.

BOOKS One good, well-illustrated, clearly presented explanation of AI history, current research, and future directions is Understanding Artificial Intelligence by Henry C. Mishkoff (Texas Instruments 1985)

MDBS's chairman of the board, Andrew Whinston, is a professor of management, economics, and computer science at Purdue University. He is coauthor of a book whose title suggests that it is a general reference but which is in fact exactly the tutorial on building Guru applications that MDBS ought to throw in with every copy of Guru it sells. If MDBS doesn't decide to include it (it won't be available until June), then track it down yourself: Manager's Guide to Expert Systems by Clyde Holsapple and Andrew Whinston (Dow Jones-Irwin June 1986).

Two books that are high on many lists of worthwhile primers in expert systems are Expert Systems: Artificial Intelligence in Business by Paul Harmon and David King (Wiley Press September 1985) and A Guide to Expert Systems by Donald A. Waterman (Addison-Wesley

1986). They're available in hardcover for \$24.95 and \$29.95, respectively.

NEWSLETTERS Those who intend to put a lot of time into expert-system development in business will probably want a continuing resource in the field. A wellwritten, business-oriented newsletter in expert systems is Expert Systems Strategies, The Monthly Newsletter for Managers and Developers of Expert Systems. It's edited by Paul Harmon for the Cahners Publishing Company, 275 Washington St., Newton, MA 02158 (\$247 per year).

COURSES Integrated Computer Systems offers a 2-day, hands-on course entitled "PC Expert System Shells," covering basic concepts, evaluation of expert-system-shell features, and guidelines to developing an expert application. The course costs \$645, ICS courses are offered in several cities across the country, with the best coverage in California. Contact ICS at 6305 Arizona Place, Los Angeles, CA 90045, (213) 417-8888 or (800) 421-8166.-John Helliwell

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really interesting about this product, and explains its \$3,000 price tag, is its expertsystem shell, the engine for creating customized business expert systems.

GURU THE EXPERT Building an oper system in Giru is a process of specifying if-then rules that express the knowledge of the "expert" being imitated. In the "light adviser" set of rules that PC Magarine built to evaluate the programs of the rules expressed ideas like. If the passenger is senting is worth pide, THEN the best processed in the property of the property

Some expert systems let you express rules in exactly his kind of language and use string-matching lechniques to connect on rule to another. Garu, however, requires that you assign variable names to each off the concepts you are working with. get's senticity was contained in the variable FEOPLE SENIOR. The president of the company has a seniority of 100 and an administrative assistant a seniority of 30. The concept "if the passerger's seniority of 30. The concept "if the passerger's seniority is very high!" ranalasties into the expression

IF PEOPLE.SENIOR > = 80

Similarly, "then the best flight is the one preferred by the passenger" translates into

THEN LET BESTFLIGHT = PREFERRED

Guru's variables can be fuzzy-that is, they can have uncertain values. Guru might determine, for example, that the passenger's preferred flight is most likely United Airlines 406 but might also be Delta 212 or, in a pinch, Pan Am 411. To express notions like "most likely" or "in a pinch," Guru uses "certainty factors," which are assigned numbers between 1 and 100. As the applications designer, you decide how to interpret certainty factors; they might be probabilities, they might be expressions of confidence, they might be notions of relative desirability. You also decide whether "most likely" translates into a certainty factor of 80 or 95.

The Guru assignment statement associated with the airline preference would look

something like this:

LET PREFERRED = {"UA406" CF 80, "DL212" CF 50, "PA411" CF 20}

If another rule concluded that American Airlines flight 263 should be added to the list of possibilities, the plus or minus operator, as in

LET PREFERRED += {"AA263" CF 60}

does the trick. Certainty factors themselves can be adjusted: a rule that conclud-

 Building an expert system in Guru involves specifying if-then rules

that express the knowledge of an "expert."

the statement

value

ed that United 406 wasn't quite as desirable as had been thought earlier might use

LET PREFERRED -= {"UA406" CF

Guru would combine the two possible certainty factors for UA406 to arrive at a new

The method of combining certainty factors is controlled by environment variables. The new certainty factor of U.4Ado could be anywhere from 64 to 80, depending on which combination method were selected. The good news is that the programmer, as is usual in Garu, has great control over the process. The bad news is that certainty algobra is, for most of us, a new field to learn and is very complex. One variable in a Garu nule set is nor-

One variable in a curru rule set is normally identified as the "goal variable." In our sample case, it was BESTFLIGHT. When you command Guru to consult a particular rule set, it assumes you want to determine a value for the goal variable. It looks for a rule that, like the one described above, assigns a value to the goal variable. When it finds such a rule, it checks the

rule's premise-the IF clause-to see if it is true. If Guru cannot determine whether the IF clause is true or false because it does not know the value of a variable-if PEO-PLE.SENIOR did not have a value, for example-then it looks for another rule whose THEN clause assigns a value to that variable (while keeping track of the ultimate goal). If the newly identified rule's IF clause cannot be evaluated either, it looks for another rule. Once it locates a rule whose THEN clause would provide useful information and for which the IF clause can be evaluated, Guru does so. If the IF clause is true, then Guru "fires" the rule-that is, it performs the action described in the rule's THEN clause. Next, it again checks the IF clause of the rule that caused it to look at the rule it actually fired, If its premise can now be evaluated, Guru does so, fires the rule, and continues down the chain. The end result, down at the end of the chain, should be a value for the goal variable.

This process is called "backward chaining" and is the most common form of reasoning in rule-based expert systems. The principal alternative, which Guru can also handle if desired, is called "forward chaining." With this method, Guru starts with the things it does know and casts about for a rule that it can fire based on this knowledge. Having fired a rule, Guru likely knows more than it did before. Then it looks for another rule it can fire, does so, and so on until all the rules that can be fired have been. With forward chaining, the process may not end with an assignment to the goal variable at all; the objective instead may be to identify all of the other variables that are, implicitly, known as a consequence of the original set of knowledge. (For example, you could assign a value to a person's seniority and to the desired departure time, and see whether Guru can now conclude the preferred flight.)

One essential feature of any expert system is its ability to explain how it arrived at any conclusion or why it wants a particular piece of information. Gurar has both HOW and WHY commands for this propose, and both can be a little cumbersome to use. Its explanations of why a rule is used are actually just regurgitations of a piece of explanatory test that you were required to tack on

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order \$100 wines, but had to stack to the stuff that matures in the truck?" "Show me." So Beffer shows you Instant answers. Instant pictures, Instant analy

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to the rule when you created it.

The programmer can control the offin which noles are tested and fired. Ovcean tell Garu to be "strict," "putient," or "eager," in its esting of rules. Each rule can have an associated priority (try highpriority rules first) or cost (Garu avoids high-cost rules where possible). Such tight control offers great power and flexibility but adds another level of complexity for

the expert-system developer.

A nule's premise, the IF clause, can be any logical expression that uses all of the standard logical and Boolean operators like greater than, less than, caual to, AND, OR, NOT, and XOR. The clause can include daabase fields (PEOPLE-SENIOR is in fact the "senior" field in the current record of the "people" database) or spreadsheet cells. IIf preparatory actions

are required after Guru has selected the rule for testing but before it has evaluated the premise, these can be specified in an optional READY clause.

If a rule's conclusion, its THEN clause, includes an assignment to a variable, then the rule itself can have a certainty factor (for instance, "If the return date is Friday and the city is San Francisco and the season is spring, then it is 80 percent certain

NEW JOB TITLE: KNOWLEDGE ENGINEER

To build a sample Guru knowledge base, a travel counseling system, author John Helliwell went through an impressive learning, programming, and debugging process,

To make this evaluation of Guru as systematic as possible, I devised a sample expert system—a set of rules embodying a particular expertise that we built into the shell.

Our sample is a travel counselor who helps business travelers choose the most appropriate flight between New York and Los Angeles. The choice, in real life and in the sample system, is based on a variety of factors: the traveler's company seniority and airline preference, the fares available for a particular flight, which airport the flight departs from, the number of stops en route, and so on. Just like a human travel counselor, the system is intended to resolve conflicts between personal preferences ("I want to go with United because I'm on its frequent-flyer program") and company policy ("You'll take the cheapest flight that gets you there before midnight!").

The system built in Guru included tables of flight times and prices; PC Magazine's editorial staff names, airline preferences, and seniorities; some queries to the user ("What is the passenger's name," "When does he/she want to arrive?"): and a dozen rules.

After 2 or 3 days of effort and a number of conversations with the Gara help team, it worked. It successfully recommended a first-class seat on the preferred airline for PC Magazine's publisher, offered the cheapest flight available to the administrative assistant, and invited an executive editor to consider staying over Saturday night in order to fit the conditions for a discount price.

In the process, I concluded that cusmized Gause eper systems will not orclinarily be built directly by travel counselors or loan evaluation officers or solvential control of the control of the basiness environment. Although the hardware will probably be available to them, the complexity of expert systems like Gause will require that a computer professional debrief the human "ex-"x's terms, and then use the program to create the expert system for the user. The expert-system rowed calls such a profes-

sional a "knowledge engineer." Becoming a knowledge engineer, I discovered, involves as much unlearning as it does learning. A large part of ordinary progamming is devoted to designing the right control structures: determine fact A first, then maybe branch to procedure B, test the value of C now, and run through this loop D times. But in an expert-system shell like Guru, sequence is the responsibility of the inference engine under the hood (although you can finetune the process). You have to trust it to decide whether to figure out the preferred flight before the lowest-priced flight or vice versa. It doesn't matter in what order the rules are devised and supplied. Rules can be added or removed at any time from anywhere in the rule set.

Rather than controlling the sequence correctly, the knowledge engineer's

challenge is to be sure that the collection of orthes in the system is complied and coherent and that it in fact covers all the cases that are likely to come up. To do so requires a debugging process that is expected as the complied of th

One consequence is that expert systems are evolutionary—they refinished. A rule set might start with an ocupie of dozen rules and grow to hundreds over the years while it is in use. (Gura can handle up to about 1,600 rules.) And although professional computer help will be necessary at the develorpment stage, it is reasonable to expect nonspecialists, with a bit of experience, to learn to add and dists trules.

Expert-system development tools are useful for more than building traditional expert systems. Because the design process is interactive, they can be very useful as prototyping and design tools. Use the shell to debug the specs and test the concepts. Then, if the shell is to slow in operation, or too expensive to buy 200 copies of, use the completed rule set as a guide to writing a normal program in CO COBOL, (or KnowledgeMan or dBASE

///).-.John Helliwell

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OTTLING

that the return day should be changed to Sunday"). Yet another set of environment variables controls how the certainty factors of the premise and the certainty factor of the rule itself are combined into a certainty factor for the final result.

Beyond simple assignments, a rule's conclusion can be any collection of Guru statements, including a call to another

Guru program or rule set. The flight adviser rule set processes two databases looking for appropriate flights. Rules could manipulate a spreadsheet or text equally well, communicate with a remote database like the Official Airline Guide, or send an elec-

tronic-mail message.

From the other side, a spreadsheet cell

or the text-processing function might call on a rule set to decide whether to include a particular paragraph in a form letter. This type of flexibility and interconnection between an expert-system shell and other software tools is unprecedented, but this power is not easy to put to use.

The difficulty, which stems from the environment-variable concept, is com-

C O U N T E R P O I N T

GURU: DENSE SOFTWARE THAT PRETENDS IT'S SMART

Are expert systems yet another solution to a problem that doesn't exist? Does this one live up to its hype? Yes and no, insists contributing editor Charles Petzold.

Editor's Note: This is the first PC Magatine Counterpoint. From time to time we will publish Counterpoints by staff and contributing editors who have opposing, divergent, or, for that matter, similarand therefore reinforcing—points of view. Counterpoint authors will be asked to become familiar with the hardware and software in question and then react to the completed review.

The hype begins on the cover of the Gurn manuals: "Introducing software with a mind of its own" and "Artificial Intelligence that means business." The hype continues on the inside win references to HAL of 2001 fame and some ponderous announcements like "Watching the development [of AI] has been interesting but not useful to business... until MDBS' introduction of Gurn."

Guru." Of course Guru is targeted toward business. That's where the morey is, 15 a tough sell. bloody doubts the applicanosis or geological drilling, where their value has already been proven. But this type of analysis of recurrent symptomatic conditions is far removed from the decision making and problem solving of most strated that the type of expert system in Guru has any widespread use in business that would warmant the price of the package and the tremendous amount of work required to master this program.

At least the creator of the early "Al."

Forgram EIII on interactive psychoanslyst now sold as a gamel never pretended
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"International that it handles
"Intzry logic" by simple probabilities,
the intelligence of Garus seems very artitive intelligence of Garus seems very arti-

Of course the hard part of workings with Garre is developing the IF-IR males in the first place. If you sit back right now and attempt to break datempt to work on Constructs, you will probably have a long more of the constructs, you will probably have a long mind that is able to examine data in a particular context and reach successful business decisions in ways that go far beyond simple (or fuzzy) IF-IREN miles.

Even a cursory reading of In Search of Excellence (or any of the other popular business bibles) reveals this truth. The best business thinking incorporates numbers and intuition, hard facts and gut feelings, tradition and innovation, systematic thinking and leaps of logic, all tempered by (let us hope) legal regulations and business ethics. Guru's expert system makes its way through the thicket by hopping from tree to tree. Good business thinking obviously sees the whole forest as well

forest as well.

Relying on an expert system like

Guru for business decisions has several

dangers. First, there is the temptation to

ignore the GiGO (Garbage In Garbage

Out) principle. With a spreadsheet at

least you can check the numbers and for
mulas. Although Guru allows you to

trace through its logic, this trace entails

nothing more than listing the explanation

added like a comment to each rule.

Second, you could very well trap youned into either stagnation by relying on a static rule set or continual (and costly) maintenance of the rules. In many cases, a good business decision means coming up with a THEN clause that does not yet exist. The new rule itself is the solution to the problem. Of course you can then add that rule to the expert system. And of course 3 months from now it too will be insufficient.

Guru will mean good business and job security for those programmers who will be responsible for maintaining the expert system. This program is not something like 1-2-3 that managers can use to sit down and play with the numbers themselves. Guru programming is more pounded by Gura's failure to exploit the features of the PC. The program makes extensive use of Ctrl-letter combinations and no use at all of the PC's function keys. The Gurar manual insists on referring to keys by its own names like FENTER, FABORT, FSUP, rather than explaining that they are the Enter, Esc, and Cursor Up keys on the PC. It may be easier for MDBS to publish one manual and refer to FABORT than to refer to Esc in the PC manual and some other key in the VAX version. But it's not easier on the programmer.

Gura's documentation makes matters even worse. It comes with four manuals. Two of them, the reference manuals, are complete, consistent, and coherent, if a little stingy in the index department. The other two are user guides; one describes the command interface; the other, the menu interface. They are incomplete, inconsistent, and incoherent. They attempt to serve as beginner's guides, but since almost evory Giaru customer will be a beginner, their inadequacy is a serious flaw. They are not tutorials, and a tutorial is exactly what's needed. Fortunately, MDBS compensates

closely equivalent to what people in your data processing department do. We all know the problems involved there. Pro- way the properties of the properties of the processing the processi

placement questions, Gurn decided that financial analysis and marketing research were the top two occupations for me, with data processing a distant third at a 56 percent certainty. In short, it's just about as accurate as any other cromputerized cocupational survey I've taken. You've been there, right! You've seen results like this and your only reaction could be, 'That stupid computer thinks I should be doing financial analysis."

oning influent admississ, time of late heard the plares "stupid computer," Yes, everyone knows that computers really are stupid, he for people use that phrase now hecause almost everyone has experienced the value of word processment programs. You no lenger call computers stupid because they have made you more productive. But the stupidest computer fund programs is one that pretends to be smart. Any forume coache with you would be computer fund production is taxwaigned.

Some people are opposed in principle to the notion of artificial intelligence. The question of whether logic circuits (in both hardware and software forms) can were installed human thought processes is ultimately a theological one. Some people believe that nothing will approach human reasoning because the human mind is intrinsically different from circuitry. I don't believe it its, and I don't reject the notion that somegods a machine will such more than the proposed of the property of the

But Guru is not that imitator and is nowhere close to it. It gives business software a bad name, It's the type of program that will bring the phrase "stupid computer" back into common office use and, in the process, not make its users any smarter either—Charles Petzold

cessfully imitate human thought.

somewhat for its woeful user guides, although not surprisingly the compensation costs. The company will offer 3-day courses in Guru and knowledge engineering in a dozen major cities for \$695. In addition, MDBS provides unlimited telephone support after purchase, though you shouldn't expect a call back in less than a day or so unless you buy priority telephone support-guaranteed 2-hour response time-for another \$300. And MDBS is considering including the Manager's Guide to Expert Systems (see sidebar "For More Information . . . "), which includes a good explanation of the expert-system design process.

CONCLISION Despite its shortcomings. Gam's in acciding product, I brings a very powerful and solid, if complex, too out of the universities and ladoratories and ainto the basiness environment, makingsper-system development much more widely possible than in the past. The program encourages the use of a new systemdevelopment technique and will make it possible to computerize many task that have always appeared too complex to communicize feed.

And because in Grave the expert-systems shell is only part of a larger systems-development environment, it makes it possible to use expert-system techniques in a casual way, just like any other tool in the programmer's stookse, it is easy to imagine a cation that includes, almost incidentally, two or three doesn rule subsystems that do particular parts of the job better than standard procedural programs would. And the availability of a \$500 (or less in quantify) a stiffled yield.

John Helliwell is a Toronto-based writer

larly one that must keep pace with the sudden changes in market or economic conditions indicative of business, will generate an unbelievable number of data processing job requests.

LMITED DECISIONS The paucity of examples available to demonstrate the system further shows that Garn is very limited for business decisions. Even the artifient tavel adviser scenario PC Magazine used to evaluate Garn requires 2.03 will tell me the best affine for towards required to will tell me the best affine for towards from which the substitution of the subs

Manhattan to Long Island. I'm also sure

that it will not tell me what any human

being can-to take the Long Island Rail-

road instead. Of course, you can add that

advice to the rules. Add Amtrak, buses,

and cars as well. But the very nature of

good business thinking involves devel-

oping alternatives to standard proce-

dures. Good business thinking might ask:

"Why travel at all? Why don't we tele-

conference instead?"
While the example used to test Guru
in the accompanying review is necessarin the accompanying review is necessarovership of the conference of the conference
revisible question. Where's the best?
The four example expert systems included with Guru as demonstrations are
equally barren. The most complex is a
top blacement questionnaire. The source
code (which looks very much like a comtime of the conference of the c

After I honestly answered the job-

PC MAGAZINE MAY 27, 1986

Without SideKick, SuperKey, and Traveling SideKick, your IBM PC is only half-awake

 ${
m I}_{
m t's}$ sleepwalking instead of sprinting. Dawdling instead of dashing, because it's not getting the supercharge of a high-speed productivity booster like SuperKey, PC Magazine's "Product of the Year." Or the real-time desktop management of SideKick," the #1 best seller for the IBM" PC. Or the electronic clout and Computer Age organizational skills of Traveling SideKick."

SuperKey "macros" are

electronic shortcuts to

You award repetition like

tmes every morning.

or cooking dinner 93

times every night-

obviously

the time-

of SuperKey, you'll find yourself

over and over again. Which makes no sense when a

typing the same set of keyetrokes

SuperKey macro cuts all that out. Macros are electronic shortcuts that can turn 1000 keystrokes

Aside from macros, SuperKey also gives you powerful encryption technology that ecrambles your files and keeps confidential files confidential. It also lets you look your keyboard, and folks would be intruders with

secret password protection.

esving pow

when once is

enough. But

if you haven't

vet discovered

getting out of bed 47



wizardry of SuperKey with the practical efficiency of

The best way to set the most done in the shortest time is to put both SuperKey and SideKick to work. They're designed to work hand-in-hand, and their complementary talents are assounding

Computer Age

If you have SideRick, you need Traveling SideRick-and if you don't combination of binder and software, making a completely new category in personal organizers: BinderWare." Il prints out information that's already in your Side/Sick Res, produces it in

Traveling SideKick gets personal organizers out of the Stone Age into the

have SideKick, you need them both! Traveling SideKick is a revolutionary new convenient familiar forms, then lets you

What's inside your Traveling Sidekick

What SuperKey brings to the party includes time-seving macros, encryption, secret passwords, and programmable and re-programmable keys. What SideKick brings includes a notepad with full-acreen editing

and wordwrap, a phone directory, sanodialer, calculator, appoint ment scheduler, and ASCII table (If you don't own a word processing program, don't buy one, because with SuperKey and SideKick, you probably don't poed one

Both SuperKey and SideKick work with your existing software, like Reflex." 1-2-3." MultiMate." Wordstar," Turbo Pascal," and dBase."

gather it all together into your Traveling Sideflick binder and hit the road Traveling SideKick includes reporterging software which produces upto-the-minute telephone lists, address fists, meeting schedules, travel inneraries, calendars, and much much more it also includes instact reference mans, airline and hotel resentation numbers, international telephone codes, and currency units. You get preprinted daily/weekly/ onthly/yearly calendar forms, alphabedged address book forms, and even a receipt envelope that clips asside your

binder. Not can order reliefs at any time.



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DESKTOP ORGANIZERS

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With the new breed of fast and easy-to-learn desktop organizers, the PC plays an even greater role in your busy day-to-day work schedule.

ddress files, calculators, and calendars are standard supplies up office, performing functions so essential that business suddenly forced to do without them. Many still arrange these tools as physical objects on their desks, not realizing that they sit right next to the one tool that could easily replace them all it the personal computer.

Desktop organizers are one of the mostpopular categories of PC software. Many PC users rely on them, and most will fiercely defend their favorite. Yet some business people still use the older, manual methods of performing standard desktop functions. People tend to stick with old methods as long as they work. You're happy enough to skip through the Rolodex when you need to make a call. If it takes 5 seconds to add two numbers on a calculator (which sits next to your PC) and type the results into the text of the letter on your screen, why switch to an automated calculator that forces you to exit your word processing program or that takes 15 seconds of opening and closing windows to accom-



plish the same simple totaling? You need to be shown significant benefits before you discard your treasured, familiar tools.

These benefits are so real that you probably won't ignore them for long. The most-competitive products in this category are now easy to learn and speedy and let you use the desk accessory functions without exiting the program in which you are working. Furthermore, some of them are so powerful and contain so many features that users with relatively simple needs might want to make them their primary application, running the desktop software much as they would a more powerful, integrated software package.

VARIOUS ACCESS METHODS By far the most conventional and popular approach to using these packages is to call them up from within standalone software. All of the programs reviewed here address this need in different ways. Some load all the desktop accessory modules into memory at start-up (maximizing speed of access), while others load only a kernel program that calls up disk overlay files (saving precious memory space). Some of these programs use up such huge chunks of memory that the latter option is surprisingly desirable, especially if you speed up access by keeping the overlay files on a hard disk

Interface methods also vary widely, the one you choose should ultimately feet the way you like to work. Some of the programs use pro-Jean's mere pro-Jean's mere pro-Jean's mere pro-Jean's mere pro-Jean's mere you feet for the pro-Jean's mere was the pro-Jean's mere you have been a select from the moving the cursor and hitting either few them or a designated function key. This method makes the program easier to learn and first easier to use, but you might find it faster and more convenient over the faster and more convenient over the proach favored by other vendors.

The way the program looks on-screen may be important to you. For example, in some cases, a program's calculator will look like the genuine article, complete with the image of a "paper tape" scrolling toward the top of the screen. Some programs let you overlay windows so that you can see more than one module at a time. while others clear the screen for each newly called-up module. These detailed graphics and multiple-window systems have the advantage of making it easy to compare data among different modules; the downside is that all that screen access sometimes. makes the program run rather slowly on a standard 8088-based system.

We haven't tried to est thoroughly for each program's compatibility with each program's compatibility with applications in this project, but be aware that memory-resident programs of cause problems when running with other cause problems when running with other cause problems when maning RAM addresses, soft-ware interrupts, and so on. In our tests, worder with each desktop package in conjunction with one or two other applications, without using a formally scripted set of tests or list of applications. While every fortest or list of applications. While every package ran into problems with insufficient problems are considered to the contract of the

cient memory when we tried various combinations of desktop modules in conjunction with other applications (especially on 256K-byte systems), only one of these packages actually bombed in some tests with other applications.

THE ESSENTIAL INGREDIENTS SO many programs are out there, all working in so many different ways, that choosing in so many different ways, that choosing among them is often as much a matter of taste as anything else. The products we chose for this review have one factor in common, however. Each contains the five essential components of a desktop organizer: text editor, address/phone number database, calculator, autofaler, and calendar?

Memory-resident programs often cause problems when running with other programs.

daily organizer. In addition, some of these packages offer extra features such as alarm clocks, which run off your schedule entries, built-in financial functions, DOS services, index-card file systems, and standalone word processing features.

new word processing tentures, many such products before For a comprehensive book at SideRick, see "11's About Time: 15 Real-Life Productivity Solutions," PC Magazine, Volume 4 Number 24. PolyWindows DestPlus and HomeBase were covered in "The Organizing Principal ple," Volume 5 Number 3. Many graphically based alternative operating systems also include most of all of the essential five features (see "Operating in a New Enriteatures (see "Operating A, for a full treatment of these propratum).

Even if you are already using a word processing package that serves your needs for text editing and mail-merge and your office is cluttered with notepads, calendars, address books, and calculators, you'll find these desktop organizers well worth the low investment.

—Dlane Burns and S. Venit

SPOTLIGHT

Lotus's Spoilight offers seven accessories to ease your day-to-day computing. In addition to a note-pad, calculator, phone list, autochialer, and calendar, it has an index-card filer and a DOS services module. And it offers all these features without having hem take up gargantuan amounts of your system's RAM. Because accessories load individually as you call them up, you need only those overlay files that you actually use on hand.

One of Spotlight's truly convenient features is that it lets you move windows around on-screen to make the best use of limited screen space. However, you cannot permanently fix windows to come up in a certain area

When invoking Spotlight from the command line, you can include parameters to specify color and to set aside additional amounts of memory for the accessories. While Spotlight should be able to decide on its own whether the system uses color or not, including the color parameter in an AUTOEXEC. BAT file is a simple enough matter. Setting aside RAM from the beginning precludes having other programs hog space that Spotlight wants to occupy and avoids annoying "insufficient memory to load accessory" messages. If you do not include the parameter and do run across the message, you also might try alternating the loading order of accessories. For example, on a 640K-byte system while running WordStar, I was unable to get up the appointment book with any other module already on-screen. I could, however, pop it





Corp. 55 Cambridge Pkwy. Cambridge, MA 02142 (617) 577-8500 List Price: \$75 Requirements: 128K

RAM, one disk drive, DOS 2.0 or later. In Short: A desktop manager with many fine features, some limitations, and a horrendous copy-protection scheme.

CHILLE AT DOMINATION CAND



Spotlight's DOS services module extends many standard DOS functions, so that you can format a disk from within an application and sort files in a subdirectory.

in when I reversed the loading order.

The notepad is restricted to a total of eight pages of 14 40-character lines per document and allows you to save and print either individual pages or the entire document you are working with at one time. While the module is adequate for writing batch files and short reminders, it can't import or export data from other programs. This inability to swap data, however, is not the rule in Spotlight; the notepad lets you paste data from both the calculator and the DOS filer. The calculator itself offers a 12digit display and the ability to define constants and retain subtotals in memory. Beware: quitting this module wipes everything out of its memory

The DOS services module may not be as flexible as fromebase's (which allows you to have up to four directories on your screen at the same time), but it does have its strong points. In addition to providing mands, the module lets you sort fless in a subdirectory by name, extension, date/ time, and filename, format a disk for provided the properties of the provided of the provided provided provided the provided provid

OFFICE

While most desktop organizers serve impolite notice on memory-resident keyboard enhancers, print spoolers, and screen grabbens waging a battle for keyservices and BIOS interments that unsuldimensylvaters. **OFFICE lives in peaceful coexistence with other programs. It acdiency systems. **OFFICE lives in peaceful coexistence with other programs. It acdiency systems. **OFFICE lives in peaceful coexistence with other programs. It acdiency systems. **OFFICE lives in peaceful shell, mach like many filte-management in this happy home. **OFFICE creates a shell that divides **OFFICE creates a shell that divides

OFFICE creates a shell that divides your screen into the 'desktop,' or workshell. OFFICE has an editor, a file cabine for documents created with the editor, a telephone book/autocialer, a calculator, an alarm clock, a calendar, a printer utility, and some redimentary DOS services. You must be considered to the control of your control of the control of your control of services. You saviable for each, and a parameter file enables you to configure the program to your system and printer.

The editor is capable of creating a document of up to 400 80-character lines and is more than adequate for writing batch files, memos, and rough drafts. You should note, though, that it lacks a tab function and automatic reformatting. And, while it can import from or export to an ASCII text file, it is incapable of cutting and pasting

delete the most recently deleted entry. The index card filer holds up to 500 cards of up to 12 lines each. The cards are indexed by the first line of text; functions include searching and goto.

Spotifyth his some compatibility probfers. While reviewing the program, I had to perform cold reboots three times—once after I had left the system for I O minutes and my screen saver utility had gone into action, a second time while attempting to call up the DOS filter from whithin Word-Sor. The third corrured while I was using a recipe program. In the latter two instances a Spotlight message in explicably influence and spotlight message in explicably influence me that the utility I had asked for was alreachy installed.

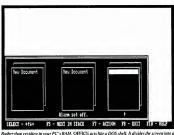
ready installed.

When is a utility not a utility? When it is copy protected. Spotlight's scheme is one of the worst have seen, too, allowing you a total of three installations one floppy or and disks. Furthermore, I found the deinstallation procedure to work sportilly at most disks. The process of the pr



In Short: A non-memory-resident desktop organizer that acts as a DOS shell. While it solves the memory-grabbing problem, it has some serious limitations.

CRICLE STRON PEADER SERVICE CAPD



Rather than residing in your PC's RAM. OFFICE acts like a DOS shell. It divides the screen into a "desktop," or working space, and an icon menu.

from the screen. Up to six documents can be on the desktop, but you are allowed ascess to only one at any given time. The calendar provides eight lines for free-formenties. You select dates either by scrolling with the function keys or by following the screen prompts and entering the date from the keyboard. The phone book comes up with a data-entry screen that contains fields for a last name, first name, two telephone numbers, and notes.

NOT MEMORY-DESIDENT While DFFEC's modes operand does held DFFEC's modes operand does who seem to positions, it has a finitiation. For one, because the program is not memory resident, you cannot call it up from within another program. For another, DFFEC is self has no facility for recognizing or of the program is not for the DFFEC in the program when you want to be DOS paths, you must write butch files and put them in the same directory as the OFFEC PFEC program. When you excute one of creates a duplete and appends commands that return you to the OFFEC subdirectory once you call you or other application.

Far worse than the limitations are the bugs in this program. For some reason, the batch files OFFICE creates in the "pathing" process fail to execute properly more often than not and create lost clusters on your disk. Also, the editor falls apart if you attempt to insert text while the cursor is resting in or on the last word on a line. Doing so either causes an on-screen jigsaw puzzle that was once your text or elecauses the editor to reject additional keystrokes until you back up the cursor and insert a space. Until you do, the computer plays a poor imitation of the bird in Prokofies's Peter and the Wolf.

OFFICE suffers from a split personality: too poorly integrated with DOS and other applications to function well as a utility, too limited to qualify as a standalone program. Until this program resolves this identity conflict, power users will likely want to look elsewhere.—Vincent Puglia

PC-DESK III

PC-DESK III can operate either as a legitimate standalone program or as an accessoty to other applications. It is not, strictly speaking, memory resident, but it achieves a similar effect by allowing you to toggle between areas of memory where PC-DESK III is running and where your applications program is running.

Unlike most desktop programs, which

use Alt. "hot key" combinations for accessing their modules, PC-DES III is completely menu driven. Also unusual for this class of program is that you can use only one module at a time. The opening some menu itss. PC-DES III 's options: Enterten Addresses, Display Addresses, SortSes. Search Menu, Print Menu, Word Processor, Calendar/Reminder, Caleulator, and Timekeeper.

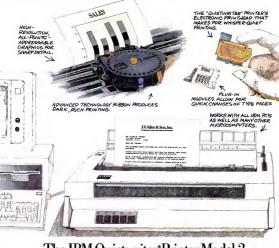
The address book is essentially a database with 14 fixed fields for your address data: 8 fields for basic name/address/ phose information, a salutation field, a date field, 2 record-type fields (for selecing subsets), plus 2 fields for entry of freeform notes. You cannot change the labels for the fields. The manual states that you can enter up to about 200 address records, more if you do not make entries in every field.

A GOOD SORT One handy feature of the address book is that it lets you sort records by four criteria: ZIP code, record number, or alphaetically by name or company. In addition, for your mailmerge or print runs, you can select subsets of records that fall within a specified date range or that match up to three different record type values, plus three different record subtwee values.

The word processing module goes a step further than the average "notepad" module: it accommodates most basic textentry and editing functions, including copying and moving blocks and searching



such as simple-to-use sorting and mailmerge, but, because it is written in BASIC, its operation can be awkward and certain operations can be slow. CROLE 6TY ON PEADER SERVICE CARD



The IBM Quietwriter*Printer Model 2 for whisper-quiet quality graphics and text.

Quality. That's the word that springs to mind when describing the "Quietwriter" Printer Model 2.

the 'Quetwriter' Frinter Model Its letter-quality printing, for example, gives you all the crispness and deep, rich gloss of libes Selectrie' Typewriter printing. The quality of its high-resolution graphics makes for full curves and sharp detail. And, of course, its whisper-quiet operation improves the quality of your work environment. The "Quietwriter" Printer's other qualities? Speeds of up to 60 characters per second, depending on pitch and application. And interchangeable plug-in fonts that support the full 252-character set of the IBM Personal Computer. (Perfect if you need output in

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DESKTOP ORGANIZERS

for text strings. Its only text formatting, however, is centreing, and it has no provision for boldface or italic. The word prosion for boldface or italic. The word processor and the address book work together to mail-merge form letters and labels. You can enhed variable swithin paragraphs, but you can only enter one variable name on a line. From the print menu, you have frive casy-to-use options, you can print or meletare, envelopes, labels, you tellford or the cards. The selection and individual bolodes cards.

The -elsection module disables you full

month of dates on the screen at a time, and you page forward or backward between months by typing plus (+) and minus (-) signs. You can enter up to five 24-character lines of reminders for each date; these notes appear on the right side of the screen when you position the cursor over a specific date. You can also enter up to 19 24character lines of notes down the left side of the screen. These remain the same no matter what date or month you are viewing. All notes and reminders are free-form entries with no special fields for times. Print options for this module are limited to using PrtSc to print out notes and reminders for a given date.

The Timekeeper module consists of a fancy appointments list, letting you log starting and ending times for tasks on lines with predefined, unchangeable column headings for client, type, and date. The current system date and time are picked automatically and entered in the appropriate columns when you keep in or log out, but these entries can be easily edited.

HOW MUCH MEMORY PC-DESK IIIImemory-partitioning scheme is a mittereating one. The program divides memory
in "Desk 1" (where the PC-DESK III
modules reside), which gobbles up 224K
plyes of RcAM, and "Desk 2" which tontoggle back and forth between each area' in
memory by pressing Alt-Esc, at which
point any PC-DESK III editing changes
are automatically sweet to disk, scheme
changes between modules are externedly
make many changes than execution to the
make many changes than reed to be saved.

This package is easy for anyone to learn and use, including those who are relatively new to the PC. The manual is, alas, actual-



PC-DESK III's address book is a fixed-field database that lets you generate mailing lists sorted by name, company, ZIP code, or record number.

when you get the package. It was prepared using PC-DESK III itself, which means it has centered headings but no bold or italic for emphasis, no illustrations, and no index (except that the table of contents at the beginning is called an index). The lack of a printed manual is not a problem in such a simple program, however, and helps to keen this package at its low trice.

Other programs out there have better schemes for memory residency, but PC-DESK III is suitable as a low-cost, stand-alone package for anyone who simply wants to maintain a simple calendar (no) more than five appointments per descriptions of the processing mostly to send letters. The sorting features are easy to use, and you don't have to have a PhD. in computer science to figure out the mail-merge feature.—Dlune Burns and S. Venit

POP-UP DESKSET PLUS

Popular Programs' Pop-Up DeskSet Plus has the potential to be a winner in the desktop utilities sweepstakes. Not only is it easy to learn and well behaved, it also in-

ly a disk file that you need to print out cludes nearly every feature you could want when you get the package. It was prepared in this category of software, adding some

tools that aren't found in any of the other packages we reviewed.

Each of Pop-Up DeskSet Plus's modules can be loaded separately, so that you can save memory space by loading only lot those modules you intend to use. Once loaded, you can immediately access the modules from other applications by typing mnemonic Alt-key combinations. Its modules include Word. Alarm Clock. Calender of the properties of the control of the properties of the control of the properties of the proper

dar, Calculator, Financial Calculator (with



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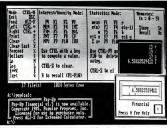
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Pop-Up DeskSet Plus includes a handy financial calculator that includes functions like natural log, square root, present value and net present value, and slope.

extra built-in functions), Voice (autodial and modern dial), DOS utilities, and Pop-Anything (run another application). The schedule files and address book files are made using predefined formats of the Word module.

One of the nicest features of this package is its true "clipboard" feature, which lets you cut and paste from Pop-Up Desk-Set Plus into other applications. For example, if you are in a word processing program and you use the calculator or any other Pop-Up DeskSet Plus module, you can press Alt-F instead of Esc to return to the application, and then whatever was on the total line for the calculator or whatever was selected on-screen will paste itself in the current location of your application. This works with all the modules and also enables you to paste entries between other different applications: simply cut from one application, paste into the Pop-Up DeskSet Plus clipboard, and then cut and paste from there to wherever else you want the data to go.

FULL-FEATURED NOTEPAD The notepad, or Word module, is really a fairly full-featured word processor. It uses WordStur-like editing and dot commands to perform all standard word processing

formatting and editing functions and lacks only a mail-merge function and support of print enhancements such as boldface and italic. However, you can always use the clipboard to move text into another word processing program for additional text formatting and mail-merge.

For address entries, the disk includes a specially formatted word processing file that lets you enter these fixed fields for an address book:

name (tab) phone (tab) company (tab) address, city, state, zip

You can use the word processing module's Search command as a database "find" operation, but you cannot sort the records or print them out to mailing labels. Once you locate the correct name and position the cursor over the phone number, you can press Alt-V to call up Pop-Up Voice and then press F2 to dial the number.

Similarly, you build your schedule in the Word module with a predefined format that is set up for entering times, like 8:00, 8:30, and so on, along the right-hand side of the screen. You enter notes about your appointments beside each time slot, using as many lines as required for the entry. Pop-Up Alarm Clock functions by

automatically placing the item in your appointment schede into your current list of slarms. As the time for each appointment arrives, an alarm sounds and the first 22 characters of the note yoped beside the time entry displays on the screen. If you find the display of these characters tool in time entry displays on the screen. If you find the display of these characters tool in the sound an alarm. Perhaps the alarm clock's best feature is its ability to run hings automatically, which allows you to set your computer to perform tasks—such as dealing an anticollal sequence—at a cer-

In addition to a simple five-function calculator, Pep-Lip DestSet Plus also includes a financial calculator that is one of the most useful we saw. It includes built-in statistical and financial functions like natural log (logarithm), log base 10, e¹⁹x, ey (figuare root), PV (present value), PV (finture value), NPV (net present value), mean, correlation coefficient, regression, population standard deviation, and "sloce" (e mX + b).

MOSTLY WELL BEHAVED Pop-Up Anything lets you "pop up" other applications, use them, and then just type EXIT to return to Pop-Up DeskSet Plus or DOS. We had no difficulty running Pop-Up DeskSet Plus modules with several other applications, including Microsoft Word and WordStar. However, the graphics characters on the borders of SuperCalc3 flashed after using any module. The DOS Utilities feature lets you execute DOS's DIR, CD, DEL (files), COPY, REN, and TYPE commands from within applications. It also includes a handy little feature that lets you look at the first line of any text files you have on disk.

The package's basic operation was easy to get used to. Pop-1/p Desket Plus comes with a reference card that proved reversely an experience of the property seeking a plus of the property seeking the



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Desktop Organizers: Summary of Features

Product Name	Price	Works within other programs	Overlay windows	Method of operation	Alarm clock	Oata management	Oata swapping
Get Organized	\$99	Yes	Yes	Alt/Function key combinations, menus	Yes	Yes	Via clipboard
OFFICE	\$39.95	No	No	Alt/Ctrl key combinations, menus	Yes	No	Import export ASCII files to text module
PC-DESK ##	\$49	No	No	Menus	Yes	Yes	No
Pop-Up DeskSat Plus	\$129	Yes	Yes	Alt key combinations	Yes	Limited	Via clipboard
Spotlight	\$75	Yes	Yes	Alt/Shift key combinations	Yes	Yes	Within some program module

GET ORGANIZED

Get Organized (GO) is a slick windowed system that incorporates full-featured word processing and database functions into the normal desktop utility lineup. In fact, GO is such a powerful package that adding a spreadsheet to it might just satisfy users who want an integrated applications package.

Installing the program is simple; just run the appropriate installation program for your system (either two floppy disks or a hard disk). GO may then be used either as a standalone program, or it may be loaded as a memory-resident utility, running quietly in the background of other applications. You can view multiple GO modules in different windows on the screen simultaneously and toggle among them using simple Alt-function key commands. GO

also features easy-to-use 1-2-3-style menu bars, which appear at the top of the screen and change for each module. You select among these by pressing Esc and the first character of the desired selection.

A FANCY DISSOLVE. For the most part. GO has a nice interface. Its screens are well designed and attractive, and you toggle back and forth between GO and whatever application you are running by pressing Alt-G. Each time you do this. GO performs a fancy screen dissolve and makes a small exclamation (a very short, politely whispered been).

ing module. The word processing module goes beyond the built-in notepad; it lets you format and edit text as extensively as most standalone word processing packages. It even includes a mail-merge feature

that works in conjunction with both the index card file and the address book. The address book itself is simply a formatted index card file, offering 13 fields with predefined (but changeable) field names. You can print out continuous-form mailing labels, 3 by 5 index cards, or rotary-type (Rolodex) index cards. The five-function calculator includes a cut-and-paste feature that lets you copy one or more of your entries from the on-screen "paper tape" into GO contains both a standard utility notenad and a full-featured word process-GO's word processing files. ard Labels Index Onit





You can run Get Organized either as a standalone program from disk or as a memory-resident utility. Shown on-screen are four of Get Organized's modules.

The telecommunications module includes options for setting communications parameters and storing multiple autodial sequences in an easy-to-use, pop-down menu. You can escape from active telecommunication at any time and use combinations of cursor keys and function keys to cony downloaded text from the screen onto the clipboard and then into other GO applications.

GO's basic operation and command conventions should become second nature within a few hours, though you'll need to

GO's one drawback is the amount of disk and memory space it requires.

devote a bit more time to learning the program's full set of word processing and database features. The package includes a quick-reference guide, cleverly printed on the sleeve that holds the two GO disks (with room for two more data disks), and the manual is attractively laid out, typeset, and printed. The manual does lack headers and footers, and so you must look in the table of contents or the index to find a given topic. But the program is so easy to learn that this shouldn't matter very much.

LOTS OF RAM GO's one drawback is the amount of disk and memory space it requires. The modules by themselves take up almost 240K bytes of RAM. For a program that calls itself a desktop utility, it is big even by today's gargantuan standards. If you want to use GO in memory-resident mode with other applications loaded. you'll need a minimum of 512K RAM and a hard disk. With a mere 256K, you can run GO as a standalone integrated system. Fortunately, GO lets you take the edge off its memory appetite by loading only a few of its modules at a time.

The program does have a few capacity limits, but they aren't restrictive for most normal uses. For example, the calendar cannot track more than 64 different recurring events; you cannot type more than 512 characters per notepad page, calendar to-

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■ DESKTOP ORGANIZERS

do list, address listing, or index card; and no index card set (file) may contain more than 25,000 cards. GO rated high marks for compatibility with other programs, working well with word processing pro-

grams like WordStar, MultiMate, Volkswriter Deluxe, and Microsoft Word (for which you must select GO's graphics option when loading). We did run into one harmless but irritating quirk related to

■ GO rates high marks for compatibility with other programs.

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CIRCLE 313 ON READER SERVICE CARD

compatibility: toggling between GO and SuperCalc3 caused the spreadsheet's row numbers and column letters to start flashing on the screen.

GO is nicely integrated, fairly fast, and has a functional multiple-window capitality. It is easy to Jean and use, It fills, as easy to Jean and use, It fills, either down drum temperated, fail-featured word processing and filing medical modern structure. In tomorrow's world of cheap, plential memory and mass, and of cheap, fail memory and mass, and programs like Ger Torganized will point the way.

— Diane Burns and S. Venit

Diane Burns, S. Venit, and Vincent Puglia are frequent contributors to PC Magazine.



Our number one choice among the packages we reviewed is Pop-Up DeskSet, for the strength of its interpration with DOS and for its speed. We were impressed with the program * ability to let us transfer data from the Pop-Up DeskSet Plus modules into our spreadsheet and word processing packages with a single, simple command, and if st straight-forward and easy to install and use, to boot.

For some, Pop-Up DeskSet Plus's database functions may be limiting. For those who want more database functions and more depth in each individual module, our runner-up choice is Get Organized, which combines desk accessories with integrated database and word

processing functions.

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ONE, TWO, BREAKTHROUGH:

REH (25

High-quality construction gives the Core drive 250 megabytes of storage, while its brand-new interface breaks the speed barrier for access times. Will other manufacturers follow suit?

honing and polishing his work to gleaming perfection. At long last, creative inspiration has struck. Breakthroughs are taking place in hard disk technology, and the latest series of high-capacity, high-performance hard disks from Core International are revealing the shape of things to

The Core HC-Series (for high capacity) hard disks are big and fast, probably the biggest and fastest drives that can fit inside an AT system unit. What's more, the HC-Series drives blaze into all-new territory and break down yesterday's barriers with a vengeance. These drives far exceed the

60-megabyte official IBM limit of the AT chassis, pushing that maximum up nearly ten times, to a half gigabyte (500 megabytes) of internal storage. Instead of shaving a few more milliseconds off their average access times, the HC-Series drives slice data transfer time in half by adopting a totally new disk-interface standard. And to put all that speed and

f late, personal computer technol- | capacity to good use, Core adds some novogy has been progressing at the el software that doesn't just let the HC-Seslow, diligent pace of a sculptor ries inch beyond the 32-megabyte DOS



disk size limit but smashes it thoroughly. allowing up to 1 gigabyte of disk storage to be accessed as a single drive.

Unlike some earlier Core drives whose ancestry could be traced back almost directly to Control Data Corp., the HC-Series drives are essentially manufactured by

Core (although the drives do include subcontracted parts). At present, the series consists of two models, the HC15 with 150 megabytes of formatted capacity and the 250-megabyte HC25, of which a preproduction model was received for evalua-

BIG BYTES On the surface, the HC25 looks like just about any other full-height hard disk you would want to slide into a drive slot in your AT, though it's a bit more rugged than most. It operates just like any other drive-at least until you decide to read a directory. If you're sharpeyed, you might notice the characters snap on the screen a bit faster than with other drives. The only hint of the amazing abilities of the HC25 is the number of "bytes free" that finally pops on the screen-250

million. The real differences are hidden inside the cast-aluminum chassis. There you'll find (if you take the head-chamber cover off and void the warranty) that the HC25 has a tall stack of seven 51/4-inch platters, the actual hard disks that data is recorded on. Each platter is covered with a sputtered pure-metal thin-film recording medium. (Sputtering is a form of vacuum plating that creates extremely uniform and very hard recording surfaces that can store information at high densities.)

Fourteen read/write heads scurry back and forth across the surfaces of the platters: 12 heads for data, 1 for reading head-positioning information from a dedicated servo surface, and I spare. The heads are moved by a high-performance voice-coil actuator that has a rated average access time of 26 milliseconds. An automatic park-and-lock mechanism withdraws the read/write heads from the active data area when the drive is shut down to protect against head crashes and media degradation even when the power is off.

Because the HC25 uses a new interface standard (see sidebar), it is not compatible with the factory-equipped, combined floppy/hard disk controller IBM provides with the PC AT. The HC25 requires its own, Core-de-signed controller card, model HC, which fits into an empty PC AT 16-bit ex-

pansion slot. A single HC card can operate two Core internal drives. The Core HC card does not replace the original IBM controller, however, because it does not operate floppy disk drives. So for most applications, you need both the IBM and Core controllers. The HC controller has on-board ROM code that permits it to boot its host computer from a HC25 hard disk.

Under normal use, the HC25 is quiet, quieter than the fan in the AT power supply. Only the rigorous access-time testing program caused a discernible noise-a gentle, subdued rattle. The only telltale signature of the voice-coil actuator of the HC25 is a strange metallic singing/humming it makes for about 1 second at turn-

on time. In addition to the normal installation of the AT internal hard disk-sliding the drive on its mounting rails into a slot and then connecting the cables-and the HC controller card, the HC25 requires special (though simple) software installation. Because the HC25 uses its own controller, the IBM AT SETUP program (part of diagnostics) is told that no hard disk is being installed. Instead, the drive is set up and partitioned using a Core-provided program, ATFDISK, which generally corresponds to the DOS FDISK program. Finally, the HC25 is formatted with Core-provided ATFORMAT and afterward can be used like any other hard disk-except you may never worry about a disk full of errors again.

One of the limitations of DOS is its socalled 32-megabyte hard disk volume lim-

it. According to the DOS standard, the largest single disk drive that the operating system is willing to deal with is 32 megabytes. To operate under unadorned DOS, larger disks must be partitioned or subdivided into a number of virtual disks, each with its own drive letter and no larger than 32 megabytes. Files must necessarily be smaller than 32 megabytes as well, because other than through the BACKUP program, no provision is made in DOS for dividing up a single file among several drives or partitions.

This limit is imposed by the hard disk structure dictated by DOS. DOS stores information on disk in allocation units called clusters, which in the normal scheme of things are made from four physical disk sectors, each holding 512 bytes. Individual files are assigned clusters through a mapping system based on a file allocation table (FAT) stored on the disk. DOS specifies that a certain limited amount of disk space be devoted to the FAT, enough to hold numbers that map 32 megabytes of clusters.

EXCEEDING THE LIMIT The remedies to this malaise, the lack of FAT, are all hard to swallow. All involve some modification to DOS, which means altering the standard that has been instrumental in making the PC popular.

The most forthright solution is to abandon DOS altogether for another operating system that supports larger disks. In today's PC environment, this strategy is probably the most foolish because it means giving up the very reason for buying a PC in the first place-its immense software base. Core allows for this possibility by of-

fering full Xenix support for the HC25. Another alternative is to modify DOS itself ever so slightly to allow it to handle bigger disks. DOS is easily amenable to such software surgery, though the complications that can arise are potentially malignant. Although DOS as delivered by IBM (or Microsoft) is reasonably bug-free and thoroughly tested, modified versions are not as blessed. Changing an individual byte in the code of an operating system can lead to unforeseen consequences, particularly when the modifications are done without the benefit of the source code, as third-party modifications must be. Fur-

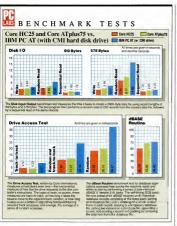


HC-Series Hard Disks Core International 717t N. Federal Hwy Boca Raton, FL 33431

(305) 997-6055 List Price: HC25 (drive only) \$8,995; HC15 (drive only) \$6,995; HC controller, \$595 (available for purchase separately) Requires: AT computer, DOS 3.0 or later,

In Short: Very large (150 and 250-megabyte formatted) high-speed (18-millisecond average access time and 10-MHz transfer rate) AT internal hard disks that can be configured

as one or more DOS volumes CIRCLE 674 ON READER SERVICE CARD



PC Labs compared the Core HC25 to two other levels of AT hard disk performance: a standard PC AT (with a CMI drive) representing the base level, and the Core ATplus72, a high-performance drive with a conventional interface. Not surprisingly, the HC25, a high-performance drive with a high-performance interface, is the clear winner in virtually every test. It lives up to its greatest potential when handling larger files: in that situation, the performance gap is even more dramatic.

ther, a modified DOS may or may not be compatible with machines other than those that it has been modified to run on. Disk swapping may lead to strange, hard-totrace failures on other machines, possibly trashing disks in the process. It may also prove unexpectedly incompatible with software.

The third, and arguably the best, alternative is the one chosen by Core for use of the HC25 under DOS: modifying the disk | dard.

parameters used by DOS without changing the DOS programs themselves. Because DOS remains unchanged, there are no worries about hidden bugs, and most programs run without a hitch. Only programs that access the disk drive directly rather than through DOS will likely have difficulties. Core even allows for such finicky programs by letting you keep part of the disk in complete accord with the DOS stan-

GANGING GIGAFILES What makes this possible is a system Core calls GIGAfile, which is part of the ATFDISK program. It works, much like other disk modifications of its ilk, by modifying the sector size on the disk from its DOS standard size of 512 bytes. In the case of the HC25, sector size is increased eightfold to 4.096 bytes, pushing up the maximum size of a DOS volume by eight as well. Disk clusters, still made of four sectors, thus grow to 16,384 bytes (from normal DOS 2,048

This strategy suffers some weaknesses. In particular, it can waste disk space when files are small. No matter how little data is in a file, it will take up a minimum 16K bytes of disk space. Every directory (except for the root directory) will also take up a minimum of 16K.

bytes).

The waste can be best illustrated by example. I copied a complete directory containing DOS commands from a DOS-formatted volume to a GIGAfile directory with a 16K-byte cluster size. The original files required about 320K of disk space; in the GIGAfile volume, it required more than 660K-for exactly the same files!

Fortunately, as file sizes become larger, the importance and the effect of this shortcoming (though not the shortcoming itself) are reduced. Moreover, when compared to earlier versions of DOS, the penalty is nowhere near as severe. For instance. DOS versions before 3.0 used an 8K sector size on hard disks, resulting in nearly as much waste.

Other manufacturers have used similar sector-enlarging schemes. GIGAfile improves on previous efforts by making its modifications only within partitions instead of across the whole disk. It is also clever enough to enlarge sector size sufficiently for DOS to handle a disk in one chunk. For instance, to allocate the full 250 megabytes of the HC25, 16K sectors are necessary. A 120K partition on the disk would be formatted with 8K sectors, and so on, minimizing the waste per file. GIGAfile extends the same strategy to make up to 1,000 megabytes-a full gigabyte (hence the name)-accessible by DOS as a single volume.

Core does not offer a drive that large, so GIGAfile allows multiple physical drives to be linked together as a single virtual

drive, exactly the opposite concept from partitioning. A single file may stretch across nearly as many drives as can be connected to a single PC—GIGAfile can gang together up to ten partitions, all functioning together as a single unit with one drive letter.

Of course, weaknesses exist in such a system. The loss of any one drive disables them all. Backing up may well be an adventure in that conventional backup systems make no provision for such monstrous files. (At the time of this writing, Core is adapting its own tape backup system to handle gigabyte-sized files. You might also use the DOS BACKUP function, but backing up 250 megabytes to floppy disk seems somewhat ill-advised.) Furthermore, finding any specific file when all files are lumped together in subdirectories on one huge drive usually is slower than putting them on smaller drives because of the time DOS must spend wending its way through directories.

Thus GIGAfile is not the ultimate solution but another tool. The strategy it represents is perhaps the best way of handling files in excess of 32 megabytes with current DOS versions. It also allows putting genuinely huge numbers of files onto a single disk when access might be limited to a single volume—for instance, in a network.

single volume—for instance, in a network.

Perhaps the most amazing aspect of GIGAfile is that it almost does not exist. There is no GIGAfile program and no unwieldy documentation to dig into. The GIGAfile system is brought to life when setting up the disk drive for the first time as part of the ATFIDSK program. It's just another option to choose from when setting up a partition.

The ATEDISK program gives you three options for each partition. standard DOS partitions (a good choice for compatibility with finicky programs that depend on 512-byte sectors). A Plaus partitions (big., over 32-megabyte but nonlinked partitions), and GIGAffie partitions (one or more disks or partitions inlaced into a single volume). After the drive is formatted, you need never deal with GIGAffie seain.

The performance of any hard disk is handicapped by two primary speed limits: average access time (how fast the read/ write heads can shuttle between individual

THE NEW INTERFACES: THE ESDI AND THE SCSI

A new industry standard speeds up drive operation, making the Core HC25 the fastest drive around.

A libough the HC2's seems destined to As et new standards in the disk drive industry, it's actually the first PC product that follows a new industry standard, the Enhanced Small Device Interface (ESDI), instead of the ST906/412 interface that nearly all PC hard disks have hitherto used. In so doing, it operates faster than any other drive you can currently connect to an AT.

In addition to its higher data-transfer rate, the ESDI interface allows several features that make designing and manufacturing hard disks easier. ESDI stores disk-configuration information on the disk itself and allows self-contained de-

fect maps.
The new ESDI interface also moves a key part of the disk subsystem, the data to the control of the disk subsystem, the data the disk subsystem, the data the disk subsystem and the disk to communicate with NRZ (not return to zero) data rather than raw MFM (modified frequency modulation) data, which is a musch better method of rending a latergith you're long transmission distances. Purthermore, it allows future use of Run Length Limited data coding, which can increase hard disk capacity 50 percent without a change in the disk drive precent without a change in the disk drive

In ESDI systems, the same controller can handle multiple disk, tape, or even floppy drives. Besides just operating all the peripherals, the same controller can also manage file transfers between them. In addition, the controller can be tuned to move data in different block sizes.

As with the classic ST506/412, the ESDI interface is classified as a devicelevel interface in that it does not directly connect into the host computer but instead requires a separate host interface. The Core HC controller combines the host adapter and the ESDI controller card onto a single card.

Device-level interfaces are often the favorite choice of system integrators because they permit configuring systems for optimum performance while still allowing the integrators to connect their products up to a variety of host buses.

The other new disk interface, the Small Computer Systems Interface (SCSI), is classified as a high-level, or system-level, interface. A system-level interface is often described as "intelligent" because it incorporates all the abilities that the controller once assumed into the interface itself

The definition of the SCSI interface specifies two speeds, a 1.5-megabyte-per-second (12-MHz) asynchronous data transfer rate and 4-megabyte-per-second (32-MHz) synchronous rate. Currently, only slower, asynchronous designs have been implemented.

That high level of integration makes SCSI drives easier for system integrators—and even end users—to work with, but it also imposes penalties, primarily in that it forces the duplication of circuitry when several peripherals are connected to the same SCSI interface.

The two new interfaces are not mutually exclusive. In fact, because they function at different levels of the PC connection, they can be used in tandem.

According to Core International, when SCSI is used in conjunction with an ESDI interface (as some disk makers are attempting), a speed limit on the order of the old ST506/412 interface arises. The rate at which data can be transferred is limited by the data manipulations that the

interface combination must carry out.

Core thus took the additional step to create its own ESDI system interface.

The ESDI controller itself plugs into the AT drive slot and the drive unit, eliminating further circuitry and speed limits.

—Winn L. Rosch

PRINTER SHARING AND PRINT BUFFERING ALL IN ONE VERSATILE UNIT

Print Master from BayTech is an intelligent printer controller that connects between your computers and printers. It ellows you to share one printer autometically, contend for multiple printers autometically, or switch by between several printers autometically, or switch by Print Mester's built-in buffer spools dete until your printer can receive it.

A VERY FLEXIBLE

PRINTER SHARER You configure Print Master's ports for any combinetion of printers and computers by enswering questions from the easy-to-follow menus. For example, with the ten-port Print Master, nine computers cen share one printer, eight computers can share two printers, seven computers can shere three printers, and so on, to one computer which can share nine printers. You can also menu-select these features: the beud rete, word size, stop bits, parity, and XON/OFF handshaking; the disconnect time-out; and form feeds. Ports may be configured individually to trenslete for printers end computers using different configurations. All chenges you make are

PRINT MASTER'S BUFFER KEEPS YOU WORKING

Since Print Master can eccept dels faster them your printer, you can dump e print job into Print Master's 512X buffer and them go on to another project. All connected users con send deta to this they can be doing it at the same time, even if no printer is available. Data is stored in the buffer until it can be sent on a first-in-first-out basis to

the selected printer. If you need more memory, Print Master is optionally available with one megabyte buffer.

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If severel users ere sharing one printer, printer shering is completely autometic. There ere no codes to send. You simply perform your normal print operation. If you are sharing several identical printers, connection is also

eutometic. Agein, you perform your normel print operation and ere connected to the next aveillable printer on a first-come-first-serve besis Print Mester will send data to all printers simulteneously to keep your printers running at

full cepacity.

If you ere shering several different printers, such es eleter printer, e laser-yet end e piotter, you do your normal print routine but insert a short printer select code (which you cen define yourse!!) as the first characters of your data. The data is then routed to the selected printer. It's that easy.

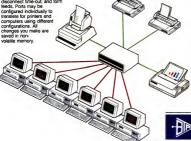
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QNX vs UNIX



What do QNX and UNIX have to do with architectural design?

The design determines the environment in which you and your applications must arrively the design dependent and your applications must arrively the the arrively and your applications running and the state of the

ONN's superb performance and compact size is the result of one dedicated design team with a common purpose, and complete understanding of both the software and the environment in which it must run. It runs quickly and efficiently on PC's and soars on an AT. Inlike Unix, QNX is capable of real time performance and is the undisputed choice for real time process control, and offices systems. You choice for feld time process control, and ortice systems for can buy an CS that offers you a 1 to 3 user dead end on anywhere from 1 to 10 users on both PCS and AT's. And we don't stop mere Luftike control university of the patch-on revolve, but a fully integrated networking system. Not a patch-on network, but a fully integrated networking system for up to 255 micros. QNX allows you to start with a single machine and grow if and as required. There are no dedicated file servers and you can attach terminals (users) to any machine. To choose a solution which ignores networking, is closing the door on your future.

Everyone is falking about fulls like systems, but no one for the property of the system of DOS software available. ONX does not force you to make that decision. You can uneither PC DOS 2.1 or 3.1 ¹⁰ as one of ONX's many tasks, IOSS file compatibility and DOS standard of the system of the system of the system of use with the system of the system of the system of use of Country In the system of the system of 1903 and not the 75'S CDN's however, was designed in

the 80's and will be a driving force of the 1990's. Over 20,000 systems have been sold since 1982.

Quantum strongly believes that there are good reasons for buying QNX, DQS and Unix. If you want more than DQS and a working alternative to PC Unix, give us a call and we will discuss your needs

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- MESSAGE PASSING: intertask communication bety any of 1000's of tasks on any machine.
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disk sectors) and transfer rate (how rapidly the data in a sector can be read from the disk and fed to the host system). The former limit has been steadily nudged upward by refinements in the physical mechanism that shuttles the read/write head across the disk surface.

In the dark ages of personal computing, when the original PC-XT was introduced, the head-shifting mechanism was essentially the same stat which cranks the heads of floppy disk drives back and forth—stepping motors, special direct-current motors that, instead of turning anosohiy, cog to discrete angular displacements of their shafts. Because the motor which the same shaft is coupled to the read-write head by a thin, flexible band of metal, its discrete angular positions are usual to disk traffect, corresponding to individual disk tracks or cythicers.

The major alternative to such bandstepper head actuators is the servo voiceoid lesign, as used in the HC2 Sa well as other high-performance drives including previous Core models. In essence, this mechanism works like an electromagnet pulling against a spring. The stronger the force of the electromagnet, the more the spring is stretched. The read/write head rides on an arm attached to the moving mechanism.

POSITIONING THE HEAD The exact position of the head in a voice-coil system depends on the relative voltages and currents. Because of the high degree of precision required, the head might not be reliably positioned. The head mechanism requires an additional device to monitor the location of the head and then feed correct information into a servomechanism. which then constantly adjusts the head position by minute amounts to keep it precisely over the track desired. In most hard disk systems, there are actually several hard disks, called platters, each with its own read/write head, and the heads are ganged together to a single actuator. The necessary servo information for positioning the stack of heads is written on a side of one of the platters, which is dedicated to that purpose. Thus the servo voice-coil system has a singular disadvantage, one storage surface wasted on overhead.

Several advantages make up for such a defect, however. No mechanical cogging motion limits how finely the tracks can be spaced, so the mechanism is more precise, and greater amounts of data can be squeezed onto each remaining disk surface. Moreover, voice-coil-type positioners are faster.

Larger capacity disks almost automatedly have a speed advantage over their smaller kin because they have more platters and more heads, and one of the heads is always more likely to be close to the desired sector. In addition, larger disks often have greater storage density—tracks of data are closer together—so heads do not need to move as far to shuttle between tracks. Little wonder, then, hat the HC2S is a genuine speed demon when it comes to

 Larger-capacity disks almost automatically have a speed advantage over their smaller kin.

average access time, dashing between random tracks in 18.39 milliseconds, one of the fastest drives tested by PC Labs.

BEYOND SMIR. The other speed limit, data transfer rate, is more difficult to circumwent, primarily because the limit is political rater harm mechanical. The data transfer rate is the realm of standardization. The principal standard in personal computing has been \$T500412. Original to the principal standard in personal computing has been \$T500412. Originally developed nearly 10 years ago when \$5½-inch hard disk drives with 5 mega better horsday, it caught on because it gave with the production of the products of the produ

Part of the ST506/412 definition is a data transfer rate of 5 MHz, or 625K bytes per second. At first that speed limit was not onerous—for instance, it was much faster than the XT could handle the information

read from a disk. Moreover, when drive capacities were limited to 5 or 10 megabytes, there just wasn't that much data to move around. Alas, today the AT can handle data faster than the ST506 interface can deliver it, and disks with capacities of hundreds of megabytes can make the wait unbearable.

NEW BREED The HC25 is the first of a new meter deed of hard disk drives using a new meter deed of hard disk drives using a new meter dee called the Enhanced Small Device Interface (ESDI), Booth ESDI and another new interface, the Small Computer Systems Interface (SCSI, pronounced as "excuzy"), breat hrough the 5-Mitz barrier, SCSI made a debat of sorts by being covered Apple Mediation. ESDI premiers as a PC product in this series of Core International drives.

The ESDI specification allows the data transfer rate to be set by the pripheral that it is connected to rather than being limited by the controller. Speeds of 20 MHz, to higher are possible. However, the HC25—along with all other ESDI drives now being turned out by other manufacturers—operates at 10 MHz, twice as fast as PC drives heretofore.

The higher data-transfer run makes: a real difference. In the modernely disk-inensive PC Magazine Labs Compiler Rouse benchmark test, the HC25 proved itself almost 30 percent faster than the soft almost 30 percent faster than the Disk Input Output benchmark test. Neither benchmark test of the Disk Input Output benchmark test. Neither benchmark test reflects the real speed potential of the HC25 because it comes not sow only with long, sequential data reads and writes, while both benchmark amounts of microprocessor overhead.

While the HC25 can be imagined as the ultimate in personal computer hard disks (at least for now), it's probably more than any single user will ever need. Both its speed and capacity make it an excellent choice for anchoring a network or multiuser system. More than that, it's a harbinger of an entire new generation of hard disk drives.

Winn L. Rosch is a contributing editor of PC Magazine.

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Style is being yourself but on purpose. Although style analyzers cannot yet evaluate your writing style in context, they can save you from some basic

grammatical errors.

THE QUEST FOR

STYLE

an integral part of your daily business-from memos to correspondence to a status report for the boss. You rely heavily on word processors to help you accomplish these tasks more efficiently, and indeed these programs do help you write faster and more easily. But they can't do anything to help you write better. How often have you struggled with word choice or phrasing-or even simple punctuation? Style analyzers can offer some assistance. These programs attempt to polish word-processed documents by checking grammar and punctuation and offering comments on style

PC-based style analyzers work in tandem with word processors by companing a given word-processed document with a set of stored grammatical and stylistic rules. They she do be word- and phrase-oriented and blind to content; if you're expecting William Safire on-disk, prepare for a rude awakening. The programs don't understand much about individual style or information in context. The English language

or many of you, writing is an integral part of your daily business—from memos to business.—from memos to bardly expect the computer to fare better.

Despite their limitations, style analyzers can help writers write better. While they seem to flag only about 25 percent of all the mistakes made in a document that a human editor would catch, the items they flag as incorrect are the ones that typically make a person's writing look the most unprofessional.

If your job demands precise writing, style analyzers do an admirable job of detecting errors in capitalization, spacing, and simple punctuation. They do an interesting, if not always correct, job of flagging the no-nos in basic Engish usage. Many of the programs also offer an illuminating statistical analysis of a document's readability based on scales developed by writing expects.

best of all, as a genre, most are single-disk packages and are relatively inexpensive, easy to use, and easy to customize. As an integral part of the editing process, these programs can help you vary your writing structure and clean up sloppy punctuation. In their mundane and uninspired way, they can help the typical busi-

ness or technical writer avoid the most common English-usage pitfalls.

PRIVATE EDITIORS The five style analysis in a slightly different manules in analysis in a slightly different manner, but cach handled the analysis in a slightly different manner, typeraphical and punctuation errors, while others accurately flagged redundancies, jargon, and trite expressions. Still others gave more "global" feedback by offering statistics about the types of lamburged and word usage in a document. The most practical were the ones visibles unsersions, copy and offered stylicis currections.

To their credit, all five programs were easy to use and supported a respectable number of word processors and ASCII formalistions, four of these programs contained no dictionary or thesaurus functions. Thus, in order to gain the fullest benefit, you've got to run your document through a speller and then a grammar/style checker, which is a great deal to ask of a nonprofessional writer.

Writers have different areas of weakness, and writing style is also a personal matter. The best way to approach these individual differences is to take a hard book at the way you write, determine what your linguistic weaknesses are, and then buy a program that best compensates for them.

GRAMMATIK II

Grammatik I, a pioneer of style analyzers for small computers, was introduced in 1983 and was modeled after the UNIX-based Writer's Workbench program (see sidebar, "Writer's Workbench: The Granddaddy of Style"). First designed for CPM and then ported to the DOS environment, Grammatik was fairly comprehensive but not especially easy to use.

Grammatik II is a new incarnation of the original program. Extensive improvements such as handsome screens and a more comprehensive statistical analysis make it generally more responsive and easier to use. Of all the programs reviewed, Grammatik II offers the greatest potential for customizing the program to suit indi-



vidual needs. This approach makes using the program more complex, but since writing is so much a matter of personal taste, it's worth the extra effort.

Based on a combination of grammatical and syntactical rules, Grammatik II includes both a 900-phrase dictionary and utilities designed to customize style analysis. Upon starting, it creates a backup, then does its marking on the original.

During operation, Grammatik II scans the word-processed document and stops when it encounters an error. It highlights the error in context on the top of your screen, then gives you the option of marking or ignoring the error. Grammatik II marks errors in four ways that range from a simple symbol mark to a full-blown analysis of the error with suggestions for alternatives. Another option allows you to print out the errors as they are being marked.

out the entrol as dray are retain marked, errors in 24 preser categories and allows room for the creation of sucr-defined categories. Unbalanced punctuation, split infinitives, neologisms, folksy expressions, and other-missed words are examples of its presel categories. Incorrect phrases of the present categories are considered as for the present categories and dom evert, and "coday"s modern age," are flagged immediately. Another useful feature allows you to mark blocks of text for the program to ignore—a gosdend if you used bingly exclusive.

STATISTICAL SUMMARIES Once the program has completed the error-checking process, it presents a summary of the findGrammatik II allows great flexibility in customizing the program to your own needs. It includes a 900-phrase dictionary and includes a variety of utilities for customizing style analysis.

ings. Statistics include information about readability, sentence length, end-of-sentence punctuation, average word length, and the percentage of prepositions and passive-voice constructions. These are helpful only if you read the manual, which explains that the percentage of prepositional phrases and passive verbs you use will be low if your writing rates high marks.

Next the document readability is graphically displayed and compared with seletions from Hemingway, Abe Lincoln, and a life insurance policy. This last bit of information is useless (poor Hemingway and his third-grade reading level) but entertaining. Other utilities include a redundancy profiler program that lists word frequen-



cies. To make corrections, you must reenter the word processor, then search out and destroy your errors.

POWERFUL DICTIONARY The real power of the program is found in its phrase dictionary and phrase editor. The dictionary is a standard ASCII file that holds the list of misused, wordy, trite, or overworked phrases. By adding to, deleting from, or modifying the dictionary, you can develop a customized tool honed for your particular profession or area of interest. Since wildcards are used to create new phrases, words like "misro" would check

■ Grammatik II is sugarcoated for the novice, but it can also accommodate the more ambitious user. It is loaded with options that reflect the type of writing you do.

for "microprocessor," "microchips," and so forth. Simple modifications like adding the phrase WordStar are easy to make, but other customizations—such as creating your own error groups (for example, split influitives or misplaced modifierence) and the processor of the property of the property of the processor o

Grammath II is good at curing puncturion and simple phrase malasies, but it sometimes misses obvious mistakes. For instance, in the test scenarios, it didn't note the improper use of "a lot," nor did it find the sexist language nor fing the missing apostrophe in "employees salary." It emoustly flagged the use of "Tues, and Fri." in the scenario, indicating the need to explanational derived by more of the distribution of mixed tenders, and check the control of mixed tenders, tun-on sentences, and improved causes.

While Grammatik II is sugar-coated for the novice, it can also accommodate the more ambitious user. It is foaded with options that make your document analysis reflect the type of writing you do. Unfortunately, many users are not in a position to handle the responsibility this imposes partly because entering phrases is so difficult and partly because they buy a program to follow its rules, not write their own.

CAUTION: USE WITH CARE

Style analyzers are clever and helpful, but careful writers avoid always taking them at their word.

A high school teacher once said to my Aclass, "A thesaurus is a dangerous thing in the hands of the wrong person." I knew exactly what she meant. She was warning us that there really is no such thing as a synonym, at least not as most people understand the word.

Few words in the English language she identical meanings. Their meanings. Their meanings rate passled around by context or loaded with comoration. There are sub-ticles attached. Fearful doesn't mean what terrified does, yet these words usually appear under each other's entries in thesauruses. Careful writers know this and use the thesaurus to help master connotation, not to search and replace. Words are not like interchangeable parts.

Their threads don't necessarily match. The same caution applies to style analyzers. Sure, a standard PC-based style analyzer can flag occurrences of passive voice, but only a machine would assume that active is always better than passive. Passive voice can be a very useful tool in the hands of a careful writer. There are occasions, for example, when you want to avoid naming the subject of an action, when you choose to be evasive. Passive voice can be essential to such an end. Mystery novelists know this: "I awoke suddenly. It was very late. The fire had burned down to its last embers; a chill crept along the floor. Suddenly, the candle across the room was extinguished, but a faint light lingered near the hearth. Just barely, I glimpsed the outline of a hand retreating from the candle holder as I sat shivering." It just wouldn't do to blurt out, "Suddenly, Martin extinonished the candle

shed the candle...."
Whether we're aware of it or not, we

often use passive voice when we are trying to avoid responsibility. After all, there are many occasions when we want to be less than straightforward. When you ask your assistant, "When's that report," and he replies, "It must have gotten misplaced," he's using passive voice. After all, he could be active and reply, "I misplaced it."

Another example, this time from a style category usually labeled "archaic language": In the next-to-last sentence in the paragraph above appears the word gotten, the past participle of the irregular verb to get. In Britain, this form of the past participle is truly archaic and, in fact, is likely to mark you as an American if you use it in speech. In the homeland of the mother tongue, gotten was long ago shortened to got so that an Englishman would say, "He's got very uppity since he was promoted." While got as a past participle is making inroads in North America, it still sounds very strange to many Yankee ears (including the mind's ear when reading). A modern-tending style analyzer that flags gotten as archaic may or may not be correct to do so. Only the careful writer can decide-as only the careful writer can know when redundancy and split infinitives and vague words are more appropriate to the work at hand than the standard-bearing alternatives implied by style analyzers.

Electronic style analyzers are not really analyzers at all; they're style analysis assistants. They are like clever children: smart but not wise. They 're not linguistic decision makers, which is why they flag rather than alter words. They know their limitations; be sure. If you decide to use one, that you do too.—Barry Owen

RIGHTWRITER

RightWriter and Grammatik II are the most universally compatible checkers: although both support a large number of word processors, RightWriter is especially fluent in supporting such word processing fussbudgets as Microsoft Word, WordStar 2000, WordPerfect, and MultiMate. It also accommodates the use of pathnames and subdirectories well

Like Grammatik, RightWriter works by comparing a word-processed document with a combination of grammar/syntax rules and a phrase dictionary. It too is an evolving product. The new version has a 45,000-word phrase dictionary and a greatly expanded word rules list.

The program has no main menu selection. The only command you need to run this program is RIGHT. This single command has three modes of operation: a standard mode that inserts comments in the document, a prompt mode that lets you choose the information to generate about the document, and a remove mode that removes RightWriter comments from a document file. All proofreading marks are created on a special .OUT file.

In standard mode, RightWriter creates a marked-up copy of the document and summarizes the information, commenting on readability, strength of delivery, and use of iargon. You type in the program's name and the file you want to check, and the program does the rest. RightWriter's proofreading process requires no user input or intervention

While the program is running, you sit back and watch prompts updating its progress. First the program informs you that it is building a dictionary and lists the word count along with some word statistics; next, it analyzes sentence structure; and finally it offers a summary of the document. To view the marked copy, you must return to the word processor or use the DOS TYPE or PRINT command.

RightWriter lists 32 categories of errors. While it does an admirable job of finding difficult items like passive voice and split infinitives, it flags the occurrence of long sentences so often that this feature is not useful. It considers sentences over 22 words long too long, and there is no way to modify this limit. Most technical

writing contains sentences of this length. and, with proper punctuation, these sentences are appropriate. RightWriter also creates an uncommon

word list, listing word frequencies and indicating which words may be too difficult for the reader to understand. The list flags misspelled, abbreviated, and most profession-specific words, which means it is not a particularly useful feature.

RIGHTWORD UTILITY A \$29.95 utility called RightWord can eliminate the uncommon-word syndrome, and if you plan to use RightWriter regularly, it's a good investment. RightWord allows you to add specialized word lists to your RightWriter disk. Since these lists can contain profession-specific vocabulary, they can turn RightWriter into a spelling checker for your most frequently used words. RightWord can add up to 100,000 words to the RightWriter disk, and it's simple to run. First, create your list of words on a word processor. Next, run it through RightWord, which uses compression algorithms that minimize disk space to turn the list into dictionary form. Finally, copy the dictionary to RightWriter. The RightWord disk contains seven professional dictionaries, including a computer dictionary. but you are limited to using just one at a time. Of course, a single program with the ability to update the word list would be

preferable, but RightWord is an inexpensive alternative.

DOCUMENT ANALYSIS RightWriter's analysis of documents in the test scenario was similar to Grammatik's. The program did not flag the lack of "close quote" marks, incorrect word choices such as affect/effect, there/their, and wordy constructions such as "a lot of." RightWriter rated my sample writing at the 13th-grade level (apparently based on sentence and word length) and suggested I make the writing less complex. The summary also told me I used too much jargon, not enough active voice, and too many superlatives. Information such as this is helpful only to those motivated enough to find out where in their document these errors lie.

RightWriter is a fast, handsomely packaged, easy-to-use program that is capable of spotting certain structural errors. Of all



If you run RightWriter as a command from a word processor, the program marks up your document and has it on screen waiting for you when you return to the word processor. RightWriter lists a total of 32 categories of errors.

BE: Proposal to Increase Automation of Salary Raise Process sportly, the management team reviews the current salary *((# 2. MORDY, REPLACE Presently, BY new or soon job title and compares it with that of the competiton. ((# 17, LONG SENTENCE: 29 MORES #))^*
ercentage increase pee job title is the assigned. Each is manually updated keypunched and a file update is Format Gallery Help Insert Microsoft Mand: RICKSKO

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WRITER'S WORKBENCH: THE GRANDDADDY OF STYLE

The challenge was to put together a package that could evaluate writing quality. Bell Labs, working on a min inducer the UNIX operating system, succeeded so well that even now no other program comes close.

Syle analyzers for the PC gain their imspiration from a collection of programs that run on a mincomputer under the UNIX operating system. This package, which comprises between 35 and 40 winer's Workbern. It has been quietly evolving at AT&T's Bell Laboratories into 1979. Several style checkers for the PC, made by other companies, have been introduced since then and have made currently, but they still don't hold a caude to this forenuneer of style analyzers.

In the heyday of Bell Labs' research, a mixed bag of linguists, computer scientists, and psychologists took an interest in the mechanics of the writing process. Their mission was to put together a package of software tools that would offer writers feedback about the quality of their writins.

the Thomas of the Hall Labs, pioneers created a nucleus of 25 program that included style-checking modules and a parts-ofspeech recognition component. The parts-of-speech checker formed the program's backbone and was written by Lorinda Cherry, a computer scientist. If sessesse the parts of speech in a document to 96 percent accuracy (equivalent to human performance on the south sales.) The programment of the south sales and the programming.

The blossoming program was adopted by the English department at Colorado State University and used experimentally. The result? Students as well as faculty by the used Writer's Workbench showed a marked improvement in writing. News of a program that helped writers created a public demand for the product. This demand led AT&T to develop and market the Writing Lab, a bundled hardware and

software system that sells for approximately \$28,000.

Today Writer's Workbench contains somewhere between 35 and 40 programs and requires about 700K bytes of memory. Under the domain of proofreading and copyediting, the program contains components to check spelling, punctuation, faulty phrases, and capitalization. To evaluate style, 70 variables help the

■ Writer's Workbench, like its PC offspring, is based almost entirely on patterns and rules though the patterns and

rules happen to be exceptionally elegant.

program assess readability by analyzing the number of sentences, word and sentence length, sentence type (simple or compound), and other factors. You can, for instance, instruct the style table to print out all the passive voice constructions or all the "nominalizations" (transformations of active verbs into nouns) in adequatement.

The latest version of Writer's Workbench is interactive and includes special statistical services that allow you to check the diversity of the words you use. Dealers sell the Writer's Workbench source code or binary code for approximately \$800. Writer's Workbench, like its PC offspring, is based almost entirely on patterns and rules—though the patterns and rules happen to be exceptionally elegant. However, the parts-of-speech program is a bit more sophisticated. It contains a dictionary of simple endings for types of words and lists of other endings like 3-d stage with the stage of the stage with the stage of the st

Many of the initial pioneers of these writing tools at Bell Labs have moved on to other pastures. The current group is not nearly as large nor as active as the original. At this stage, Writer's Workbench seems to be enjoying its years of maturity.

Ebewhere, researchers are developing new strategies for exploring the writing process. All BM's Waston Research Facility, a group on the Figstle Project is using a promising sentence-passer-based approach. Other researchers (who prefer not to comment on their R&D) are uivestigating real-time style checking, while still others are developing a leuristic approach in which the computer continualtion and the state of the control of the conputer state of the control of the c

writing. Do pure research environments spawn better programs than the competitive market? Lawrence Frase, a member of the original Writer's Workbench technical staff, feels that the current crop of style analyzers for the PC doesn't live up to the standards of its AT&T ancestor partly because of marketing considerations. "These program creators would like to sell their programs for \$45," says Frase. "They won't write a package of 40 programs. Besides," he adds, "PC program creators shy away from attempting such sophisticated programs as the Writer's Workbench parts-of-speech component."-Robin Raskin



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houng your own computer shorthand, for Instance, you might continually type the phrase. Yety fluty yours. With Replat/Miller or "chord" such as IY can be assigned to replace the 17-leystreet phrase. Simply press the 1 and Ystreet phrase. Simply press the 1 and Yto computer to the phrase of the 1 and 1 RapidWiller—from Quixale Corporation bringing a breakthrough in word processing

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VISA

the packages, RightWriter is the most professional looking; the manual is actually typeset. Its greatest shortcoming is that some of the ratings and indexes are too simplistic. This is puzzling, since the program is based on the Department of Defense technical writing standards,

PC-STYLE

PC-Style is designed, programmed, and distributed by Jim Button and Buttonware. Like Buttonware's other PC programs, it can be copied and distributed freely, but if you use it, you are asked to pay for it. At \$29.95 it offers a quick synopsis of a document's style but does nothing to help immove a difficult sinuation.

prove a unificult standard.

PC-Style bills itself as the program that has a way with words. Actually the program is so visually oriented that "a way with pictures" would be more apt. The program analyzes your document and creates a graphic and percentage-based breakdown of your strong and weak areas, based on a series of built-in scales.

THE PC-STYLE PREMISE Button's premise is that good writing demands short sentences, many action verbs, and the use of personal pronouns. If your writing is not geared to reflect any of these qualities (lawyers and academics, for example), this program is not for you.

PC-Style is controlled by a modifiable PRO file. For example, you can change



Jim Button's shareware offering, PC-Style, offers a highly graphical representation of your writing style. It allows you to modify the late of phrases that it will flag automatically, but only up to a 300-word limit.

the range on any of the scales and add words to the PC-Style word list (though the list can hold only 300 words). Altering the scales puts the onus on you—not the program—to be the grammarian and stylist.

The PC-Syle fask contains 30 files and reads more like a magazine than a program. The files include the manual (which you need to print out), copyright notexes, registration forms, order forms, and information on other products. Only a handful of files relate to the style checker, and only one—the PRO file—is required to run the program. The program: they fusks only 23K bytes of memory. No matter how compressed the scales may be, that's not

much room for extensive storage.
After analyzing your document, PCSofe generates a report. The main area of
the report offers statistical informaabout sentence and word length, the perand action words, then creates a readabilty index. Alongside the main area is an interpetive scale showing you the range for
each category, from poor to best. Overall ratings for readability, personal tone, and
action are displayed graphically below the
main area.

NO PROOFREADING That is the entire program. Unlike others in its category, PC-Style does not actually proofread the document or mark the copy. The manual cites additional reading by scholars such as Flesch and Gunning (both have developed readability indexes). Still, because it reports higher readability scores than any of

the other programs, I am skeptical about its validity. To its credit PC-Style is lightning fast, reads any ASCII or WordStar file, and lets you print the results, but in this case, you get what you pay for.

This program's usefulness eluded me. Jim Button's own manual scored in "good" and "excellent" categories when I ran segments of it through the PC-Style program. My own samples both scored only "poors" and "fairs." My readability score was 16.3, almost three grades higher than the level at which any of the other proerams scored my documents.

PC-Style's firm stand on action words, short sentences, and personal pronouns makes it a good choice for people who write with these criteria in mind, but a poor choice for anyone else.

PUNCTUATION AND STYLE

Pancusation and Sple was also developed to DOS, attesting to the evolution to DOS, attesting to the evolutionary nature of many of these products. Like the others, of many of these products. Like the others, pancusar, and style is a punctuation and Sple is a punctuation and sple grammar, and style checker, but it treats grammar, and style checker, but it treats to be compared to the control of the splending the splendi



Bellevue, WA 99006 (800) JBUTTON (206) 434-0479 List Price: \$29.95 Requires: 40K RAM, one double-sided floppy disk drive, DOS 2.0 or later.

or later.

In Short: A document analyzer that compares your document with a series of scales and graphically illustrates its strengths and

CIRCLE 664 ON READER SERVICE CARD

picks up all those awful "white spacing" errors symptomatic of word-processed documents. It checks for isolated punctuation, incorrectly spaced ellipses, and, for WordStar users, it even checks for unpaired commands. But although Cleanup lets you mark the errors in your text, it will not print them out.

The Phrase portion of the program is based on the UNIX System's Writer's Workbench. The program compares your document against a fairly extensive list of frequently missued phrases, then suggests alternatives. When it flags an error, you can choose to mark the error in your document, ignore the error, suppress the sentence, or print the correction.

Punctuation and Style, like Grammatik

II, is highly modifiable. For example, you



The Phrase program is more difficult to modify. All the customized commands are powerful, but not as easy to use as those accessible from *Grammatik*'s main menu structure.

The Punctuation and Style phrase dictionary contains 700 entries, along with suggestions for correcting poor phrases. A powerful suppress-phrase feature prevents the program from recognizing certain phrases. This suppression cleverly lets you

accommodate exceptions to rules.

Purcusation and Style is as much a tutorial on English usage as it is a program.

The Phrase section of the documentation contains some fine tutorial material on effective writing. The manual also lists the complete contents of the phrase dictionaries, organized by type of error, and contains a handy rule book for punctuation and some of the program of the pro

Nonetheless, when Panentation and Sylve checks punctuation and phrases, it is nores such items as improper tense, improper clause, and split infinitives. Panentatation and Sylve deals with the more concrete rules of sylve and grammar and does not attempt to delve into murky wareness. So, while the program does achieve considerable success, you must still do some stylistic work on your own to uncover the errors it does not address.

ELECTRIC WEBSTER

Of all the style analyzers reviewed, only Electric Webster includes both spellingand grammar-checking facilities. Electric Webster conducts its document analysis in a three-step process. While its treatment of a document is thorough, the process is a bit confounding. First, Electric Webster runs documents through its 50,0000-word internal dictionary to flag and list typographical and spelling errors. Next it runs a powerful hyphenation feature that lets you customize the placement of discretionary hyphens. Finally, it looks for grammatical and compositional errors based on a substantial phrase dictionary and stored rules of punctuation. As with any program that tries to do it all, it omits some attractive features that the other style analysis programs incorporate. But for those who'll give up a few features for the ability to handle spelling and document checking as a single process. Electric Webster is the package of choice.

An Electric Webster session begins when you type the document name at the program's first prompt. If you include an asterisk next to the filename, you can print the report's output as well, though it would be preferable if the program prompted you for actions such as printing and quitting.

THE GOOD PART COMES LATER

After making a speedy word count, Elecric Webster begins running its speller. During this first pass, the speller merely lists the words it considers incorrect. It does not offer alternative spellings, nor does it take corrective measures. This shortcoming is remedied only later on in Electric Webster's hydpenation phase.

During the hyphenation session, you



Punctuation and Style actually consists of three separate programs for checking style, grammar, and spelling. The Pirnase portion of the program derives from on the UNIX-based Writer's Workbench program.



ANALYZING THE ANALYZERS

Three documents rife with errors put these style analyzers through their paces and it was the style analyzers that came up short.

How do you create a test to evaluate
Language literature would be disastored.

Language literature would be disastored.

Language literature would be disastored, and the disastored when run through hose lessthan-literary style analyzers. I created
three scenarios designed to test the programs with the types of documents they
should handle best. They consist of a
press release in letter form, a bosines
memo excepted from a book on techniering neighborhood news. All contain a
number of commonly made errors. Two
of these scenarios follow.

PRESS RELEASE: AN EXAMPLE OF LUDICROUS GRAMMAR Dear Sire:

A amazing event has recently taken place. The Advisery Board of the Association For Good Grammer in Computer Publications has reached it's decision for a winner of this year's People in COmputer Publications Contest.

Among the ten who were chose as finalist for the award were 3 women. The affect of this choice will be felt industrywide, women have come of age in discovwide, women have come of age in conterists, each sures several different programming languages and were also scholars of english usuage. In his keyluded to the famous "Women in Computting Speech delibered at the University Of that these conscients each reflected her personalities in the professional career.

The winner, Ellen Mcquire has been oustanding in her publication record but also in her new programming accomplishments. She is fluent in C, Pascal, LISP, and a lot of other programming languages and has a very strong flair for recursive structured programming technique. A symbol of today's modern wominge. A symbol of today's modern wom

an Ellen is also a accomplished long dissance runner and mother of 4 children, would share the award money with others in her office. The reward for the winrer is ten thousand dollars and a position as Chairman of Computer Crummar in the Wason Research Laboratory Celine, Ka. Ellen contributed regularly to Infosorre. Computer Ware Daily, and other control of the cont

Ellen is this years winner and the other contestants will be back nest year for another powerpacked competition. Beers of observation, fluency and persistence, tregardless of who one, it is very important we recognize the glory of this acheivement and the culmination of another year with the glorious tradition of swed Computer Grammar.

way to nearly every desktop in America.

The press release letter reproduced here contains many punctuation and style errors, and overall the style analyzer programs missed more than they found. None of the programs pointed out"Dear Sirs" as sexist, none questioned the incorrect use of "it's" for "its decision." none cited "a amazing event," and only one questioned "Advisery." None of the programs spotted numbers written inconsistently as numerals and as words, and none found anything wrong with redundant phrases like "today's modern." None touched mixed tenses and mixed persons. In a document as hopelessly rife with errors as this one, they flagged only the more obvious mistakes. They paid no attention whatsnever to context and left the bulk of the error-flagging to human editors

This shamefully constructed press release received a high score on the readability test (13th grade), presumably because it contains long sentences and big words. Even when I ran the document through each program consecutively, the collective effort still produced a stylistically poor document despite the programs' efforts—and, in part, because of them.

MEMORANDUM

TO: Curt Gowdy FROM: Systems ANalyst Grou DATE: September 24, 1984

RE: Proposal to Increase Automation of Salary Raise Process

Presently, the management team reviews the current salary for every job title and compares it with that of the competition. A percentage increase per job title is the assigned. Each employees salary is mammally updated keypunched and a file update is one. This process requires the hiring of temporary employees and takes 2 wis, to combete.

The process can more efficiently be accomplished by the following process. 1. The developement of a program to update each employee's salary by the re-

quired percentage.
2. The developement of a program

producing a summary report for the 3. Utilization of the word processong capabilities of the computer to produce the letters of raise notification.

Time savings - eliminates manual updating of salaries and eleiminates keypunching.

Cost savings ... eliminates the need to hire temparary help
 Increase in employeed satisfaction

- salary raises are giving sooner.
This system should work very well and
a lot of employees will be greatful to the

managment.

The programs reviewed fared better in

this scenario, where the mistakes were more typical of those made in a business environment. RightWriter complained about the long sentences and heavy use of the passive voice. Punctuation and Style excelled at finding poor punctuation. All of the programs queried the use of "presently," but only Electric Webster caught "greatful." As I mentioned in the main article, none of the programs did anything about organization and parallel structure-the menso's two greatest areas of weakness.

My ten-page newsletter, too lengthy to be reprinted here, did become somewhat tidier after I used the style analyzers. The programs suggested that I eliminate some passive voice constructions and replace some "high-flown" language such as "utilize" with easier-toread words such as "use." They also helped clean up sloppy punctuation (for example, commas should be inserted within quotation marks and ellipses should have white space separators) without causing me to strain my eyes on the display screen. However, I tended to ignore their advice about long and complex sentence structure since I felt my audience could handle it.

Overall, these programs are interesting nitpickers, but they really function only at the microscopic level. I'll bet that even the best writers will occasionally produce a few obvious mistakes in a document that these programs can sniff out. But when it comes to evaluating style in relation to context, they all fail. To judge content, flow, organization, and sentence structure, I recommend that you find a sympathetic and grammatically knowledgeable friend who likes to read and is willing to help. At this juncture, software that analyzes writing style can only make your document more technically correct, and it does even that in a limited fashion. -Robin Raskin

specify whether you want hyphenation, and the rest is done automatically. You set the hyphenation configurations in a separate modifiable file that creates fine-looking, properly hypherated copy

Also during this hyphenation phase (but not during the spelling phase), you may browse though the program's dictionary and correct spelling errors. Each single misspelled word is now displayed in turn at the top of the screen, and you can search the program's dictionary to find the correct spelling. As you search the dictionary, a question mark in the dictionary's word list indicates the program's best guess about the correct spelling.

You can correct the spelling manually or automatically. To do it automatically, you need to position the selection from the dictionary so it is at the bottom of your dis-

Сотисота

Software Inc

In Short: A combination speller hyphenatic

program plus grammar and style checker.

ORGET 687 ON PEACER SERVICE CAR

FILE Electric Webster P.O.Box 6111 Albany, CA 94706 List Price: \$169 95 Requires: 64K RAM. DOS 1.1 or later; two floppy disk drives rec-

play screen. Since this positioning never occurs as a default, you always have to monkey around with the cursor keys to align your spelling choice at the bottom of the screen. If the suggested correction were highlighted on-screen or if it anpeared automatically at the bottom of the screen, these positioning shenanigans would be unnecessary.

During this hyphenation/spelling part of the program, there is no in-context spelling display. Though the program does have an "in-context" spelling checker, it is disturbingly unavailable until the grammar-checking part of the program is enabled. Thus, you don't see a corrective spelling display while the spelling checker is running, and you don't see in-context spelling errors while the corrective session is running. The elements are all therethey're just muddled.

GRAMMAR CHECKING During the grammar-checking session you will see an in-context display on the top of your screen. Your potential grammatical error is highlighted and categorized. A series of prompts lets you correct the error. Options include marking the text, asking for suggestions, and omitting or expanding the phrase.

When you ask for suggestions, nine times out of ten the response is "No suggestions," Expanding the phrase-the most obscure option-can be tricky. You can substitute one phrase for another, but they've got to be carefully aligned. This



Electric Webster contains an integrated spelling checker. Its most interesting feature, though, is its ability to create a minireport with a summary of the style errors it has flagged for you to preview.

STYLE ANALYZERS: A FUNNY BREED OF SOFTWARE

Style analyzers can help automate the revision process—the part most writers hate—and improve your writing ability as they do it.

Word processors made easier writ-ing a reality for the masses. With the reality comes a good deal of sloppy writing. Clichés, wordy or stock phrases such as "due to the fact that," "in terms of," "in such a way that," and other often used but never-any-good phrases pervade our correspondence. One of the main benefits of style analyzers is that they force us to think about writing by spotting these phrases and flashing them on our screens. Like trained rats, if we see the phrases flashed before us often enough, we'll eliminate them from use. As our awareness of good writing increases, there's bound to be a decrease in

Two opposing tendencies are at play in the market for style analysis software. On one hand, an increasingly sophisticated group of PC users has justifiably rising expectations about this kind of software and what it should do. If a program claims to check grammar, then it had better check grammar and not miss a trick. On the other hand, true style analysis is unbelievably complex and requires AIlike capabilities. The program needs to understand each component of a sentence, relate all the components, and then

pass judgment on their suitability. Perhaps this kind of coordination will be possible in a future generation of software programs.

Until we get there, we can use only the simple tools available to eliminate a certain percentage of poor writing. Current style analyzers can detect right and wrong at an elementary level, but they are "content-dumb." What most of them do is match the document against a finite set of grammar rules and against a set of potentially awkward phrases. Certainly one major function of a style analysis program is to flag simplistic but frequently encountered errors in language usage. However, equally important is the program's ability to make the writer more aware of certain elements in the

writing process. Implied in a style analyzer's use is its eventual disuse. These programs train as they work. While users should continue to run them as a check, eventually the programs should have nothing to do but confirm the correctness of the document. Style analyzers-like their cousins, spelling checkers-are a funny breed of software: they're the ones you'll love not

using.-Robin Raskin long sentence.

Actually, the phrase dictionary of this program consists of two different files. One file contains the phrases in question and is loaded into memory; the other offers alternative suggestions and remains on disk. These files are also customized, and the program uses a simple format including relational <,>, or = symbols to define misused phrases and suggest replacements

Notably missing from the phrase dictionaries are any abbreviations. Electric

viation like wks, to signal the end of a sentence; consequently, it flags errors incorrectly because it finds that the word following the period isn't capitalized. Electric Webster has fewer error categories with fewer phrases in them than Right-Writer, Grammatik II, or Punctuation and Style. Browsing through the phrase dictionary makes it obvious that the content is not as thorough as the competition's. Even though you can customize and add phrases, phrases are more likely to be put to use if they are in the dictionary from the start.

IMPROPER PUNCTUATION While the spelling checker and grammar components are substantial, Electric Webster loses performance marks for the Punctua-

 Electric Webster let my ellipses, unclosed quotes, and double-period sen-

tences slip by unnoticed.

tion component. It let my ellipses, unclosed quotes, and double-period sentences slip by unnoticed, and it also missed my habit of putting in extra spaces between words and sentences.

The program is also plagued by small operational annoyances. For instance, I could not find an easy escape from many of the program's screens. I could not back up to a previous correction when I accidently hit the wrong selection. All too often I succumbed to a warm boot-my only avenue of escape from the rigid program operation. Although the program works, the user interface on this program could stand some modernization.

NOT YET CRASH-PROOF Electric Webster supports the greatest number of offbeat word processors but omits some of the more popular ones. The manual cites the program as working with Spellbinder. Open Access, and WordStar but never mentions how to use other document formats. A call to Cornucopia informed me

entails counting the words you are replacing to the right and left in your sentence and indicating them with < and > signs. None of the other packages have this feature, but, awkward as it may be, it helps Electric Webster flag some tense-related emore

Finally, Electric Webster offers a statistical summary of the document based on average word, sentence, phrase, and paragraph length, then gives you a readability score. You can also use a configuration program to customize style parameters such as the number of allowable words in a Webster considers the period in an abbre-

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■ STYLE ANALYZERS

the stylistic issues involved under the fea-

tures table heading, "Style and grammar capabilities": split infinitive (to heartily eat; preferred: to eat heartily); passive

voice (were taken, as in "these actions were have); homonyms (flair, flare).

ABS	Summary of Features and Performance	RightWriter \$95	Grammatik ii \$89	Electric Webster \$169.95	Punctuation end Style \$125	PC-Style \$125
	Copy protected					
s	Spelling checker					
	Displays error chack on-screen					
	Suggests alternatives for errors					
FEATURES	Marks up text	-				
5	Marks text with comments		-			
Œ	Allows customized rules and phrases					
	tgnores blocks of text					
	Documentation					
	Word processing compatibility	The second second				
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Ĕ	Flags unbalanced punctuation			1	1 0 4 0 C	
₩.	Flags white-space errors	10.1				
AAR PUNCTUATION CAPABILITIES	Flags capitalization errors					
	Flags double words					
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2	Readability					
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	Word-frequency studies					
ance ana rs fla	ed features have been given perfor- ratings. These ratings are based on dysis and comparison of the total er- agged in each category after running ample documents through each style	taken by manageme voice, as in "manag tions"); awkward la that; archaic langua jargon (last but not	gement took these a inguage (due to the ige (therein); cliché	fact ==	yes, feature availa	

(chairman; preferred: the chair or, if appro-

priate, chairwoman); vague words (rather, somewhat); wordiness (at that point in time); wrong word (must of; correct; must

STYLE ANALYZERS

that Desk Mate, XyWrite, LeSScript, Volkswriter, and PFS: WRITE will work as well. The manual contains no discussion of ASCII files or other formats, even though the program appears to work with most (but not all) ASCII output. When I ran the program with Microsoft Word (stored as straight ASCII), I managed to crash the program repeatedly.

Subsequently, I learned that Microsoft Word's lack of an end-of-file character was throwing Electric Webster off the track and causing the crashes. Many popular PC-based word processors don't use

■ Electric Webster works with most (but not all)

ASCII output.

this character anymore. My only recourse was to use DOS's DEBUG and insert the character into the file. This is not a process you want to go through routinely. When I informed Cornucopia of this situation, the company promised to remedy it immediately; so stay tuned if your word processor does not use end-of-file characterio-file theory.

Electric Webster has the potential to be an effective style analyzer. It contains two

Robin Raskin is a frequent contributer to PC Magazine.



Grammatik I is the old codger of the PC-based style analyzer scene. Its offspring, Grammatik II, has a handsome user interface and some sophisticated phrase rules. Grammatik II's Achilles' heel is its treatment of punctuation.

If your writing suffers more from misplaced periods, commas, and quotes than from overuse of clichés andt site expressions, then Punctuation and Style is your bet bet. Its punctuation is punctilious. important proofreading functions—spell and analyze—in one package. But a limited dictionary, a less-than-robust selection of prompts for the grammar and spelling components, and terse documentation lim-

it this program. Worth noting is that Cornucopia recently released Whoops!—a real-time spelling checker—and that the company has some exciting ideas about future grammar and style programs.

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CIRCLE 479 ON READER SERVICE CARD

THE CASE OF THE DISAPPEARING CABLES





Here's a puzzle for you, Watson! Look at this new MicroManager! Can't say i see anything out of the ordi-

Can't say i see anything out of the ordinary, Holmes.

Think, Watson, not about what you see, but rather what you

level to level through secret compartments.

don't see.

But, Holmes, everything seems perfectly in order.

But, Holmes, everything seems perfectly in order.

Precisely! When did you ever see a printer station that was perfectly

in order, Watson?
Zounds, Hoimes! Some rascal has stolen the cables!

Zounds, Holmest Some rascal has stolen the cablest Soit seems, Watson, but observe, carefully—there's more to this than meets the eye. The cables have been clevely concealed right underour very noses! Notice how each cable disappear through a knockout hole and enters a channel in the rear of the device. Remove these vertical panels and—voila!—we discover the cables passing from

MICROMANAGER

Holmes, you've solved the Case of the Disappearing Cables!

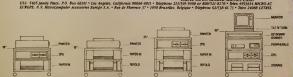
Elementary, my dear Watson. But the MicroManager has solved an event deper mystery—where to put the printer? See how this Basic Floor Unit is actually composed of individual sections—"modules," Americans call them. Consider the possibilities, Watson—single modules used as desktop printer or monitor stands, for keyboard storage, or what have you. Combined, they can form any sort of mobility. There's even an optional paper refolding attachment

Cunning, isn't it?

By Jove, Holmes, this new MicroManager is the most diabolically closer desires we've ever one countered!

clever device we've ever encountered!
indeed, Watson. Thank
Heaven its creators are.

on our side! ACCESSOTIES, Inc. CIRCLE 314 ON READER SERVICE CARD



TANDY 3000 HD

A FRATERNAL TWIN OF THE PC AT

Tandy, once a rebel in the PC world, has released its first 80286-based machines. Competitors beware: The Tandy 3000 and 3000 HD are serious AT-compatible contenders.

ne cupon a time, Radio Shack was the coil yagem in town if you wanted a microconder to that you wanted a microconder together youned. In that long ago, innocent era (1975 or thereabous), you either pored through the back pages of electronics magazines for computer parts you juvi-rigged into something remodely programmable or you plunked down money for a pretty pleasie but called the TRS-90 and "attachmens": a cassette plant you can be computed to the transfer of the pretty plant you wanted to the transfer of the pretty plant you wanted to the transfer of the pretty plant you wanted to the plant you wanted to the pretty plant you wanted to the plant

For any but the simples business applications, the early TRS-80 models were ponderously slow, mass-storage capacity was a joke, and well-designed applications software was nonexistent. Tandy Corp. persisted in marketing the machines though, long after the IBM PC made its initial splash. Following its own drummer, Tandy stubbomly kept its micros apart, alone in a world of PC-compatibles. Then it all changed.

Bowing to inexorable market pressures, Tandy nelessed several computers that ran under MS-DOS instead of the company's own TRS-DOS. Each successive that the company's that the company's that the company's consistency of the company of the company

volutice a Youtment?).

In keeping with this trend, the Tandy 1000—Tandy's first machine to be based on Tandy's first machine to be based to the total total to the total to the total to the total total to the total total to the total total total to the total total

A DIFFERENT WAY OF DOING THINGS The subtle differences between the Tandy 3000 and machines following the IBM AT design pattern are mostly beneath the skin. To keep the machine's desktop footprint agreeably small (only 3281/s square inches versus the AT's 3511/4 square inches), the designers laid

Each succeeding model that Tandy now sells comes closer to perfect IBM PC compatibility.

ent manner. First, the central front of the chassis (the snace used in most AT-compatibles for a full-height hard disk) has been given over to a large cooling fan that directs its output of relatively cool air directly onto the machine's ten expansion board slots, instead of drawing hot air away from only the power supply. This approach is unquestionably a better cooling arrangement than IBM's.

Despite the machine's overall smaller size compared to the AT, the designers have managed to provide two more fulllength expansion slots than are available with the AT. Three of these slots are designed to accept only 8-bit boards, with the rest usable by either 8- or 16-bit boards. In a machine equipped with a single monitor. floppy and hard disks, and single serial and parallel slots, you still have eight slots left over to fill to your heart's content. Because of the fan placement, you can do so without fear of overheating those expensive circuits.

DISK DRIVE LIMITS The drive rack on the right has slots for three half-height drives, only two of which are accessible from the front with the machine's plastic front panel in place. The topmost drive slot is dedicated to the 1.2-megabyte floppy drive that is standard on both the 3000 and 3000 HD models, with the 20-megabyte Mitsubishi hard disk offered in the 3000 HD in the inaccessible, lowermost slot be-

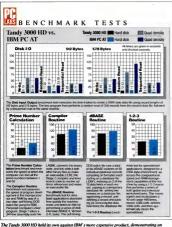


hind the 3000's plastic front panel. In effect, therefore, you have only one accessible drive slot left in which to mount a second floppy drive, hard disk, or cartridge tape backup unit. You might just want to devote one or more of those extra board slots to one of the plethora of harddisks-on-a-card now emerging on the market and use that drive slot for a unit with a floppy-disk drive or internal tape-backup

The 3000's keyboard follows the familiar 84-key AT layout exactly, which

makes it ideal for typists used to the Selectric arrangement. Otherwise, it's not remarkable. The feel of the keys is rather light, giving little tactile feedback, though there is a definite click to let you know the key's been pressed. It uses an IBM-compatible DIN plug, so it can be replaced with any keyboard on the market, including IBM's own if you want.

The Tandy 3000 HD supplied for this review came equipped with Tandy's ubiquitous TRS-80 color monitor and adapter. Offered as an option with every other



The Luny FOOT Them is own aguinss 1500 is more expensive product, we monostrating in impressive price/performance ratio. It outshome the AT in applications tests, and while it didn't perform quite as well in disk I/O operations, it still gave a respectable showing.

Tandy personal computer, this monitor can produce resolutions of up to 640 by 400 pixels in black-and-white mode. The graphica adapter and monitor combination can also produce the same resolution for 4-tool graphics mode through the technique of double-acaming, while 230 by 200-juile resolution in the best you get in 16-tool produce the same resolution for 4-tool graphics and through the 150 by 200-juile resolution in the best you get in 16-tool produced through the 150 by 200-juile resolution in the best you get in 16-tool graphics, adapter can be used with Tandy's 399 monochrome graphics, though this claim was not tested by PC Magazine Labs.

A WHIRLWIND IN DISCUISE. The tests we did mn on the Tandy 3000 HD proved it to be more than a match for the AT-compatible machines we've relevant in past issues of I'M Magazine and the best DOS compater. Tandy has made yet. The DOS compater Tandy has made yet. The pits a hard disk against a spectrum of tasks, concluded that the Misubshild thread with the Misubshild thread that the Misubshild thread t

from The Norton Utilities rated the Tandy at a whopping 8.4 on its scale, or better than 30 percent faster than the AT. In test after test, the Tandy held its own against IBM's more expensive product.

While the system lacks some of the amenities common to AT-class machines—like a lock with a fancy chrome key to dangle before the envious eyes of users of lesser systems—Tandy has included such niceties as a hardware-reset button on the front panel (commonly referred to as "the switch that IBM forgot") and a simple dual-voltage power system.

More important, the Tandy 3000 HD nearlast the recognition by Tandy Corp. of the current state of the personal computer market. The 3000 and 3000 HD will accept just about any add-on board, applications software, or peripheral device made for the IBM AT, freeing the purchaser from the fear of being locked into buying products from a single vendor. With Tandy's wast retailing and technical support network, expect to see this machine mading waves in the marketplace.

David Obregón is a computer consultant based in New York City.



In Short: An excellent, lower-cost alternative to the IBM AT from a company with an extensive retailing and technical support network.

Clock Speed: 8 MHz

Expansion Slots: Ten





Why the Hercules Color Card is better for your XT than IBM's.

Did you know that there's a color graphics card specially designed for the XT"? It's called the Hercules" Color Card. We think that it's better for your XT than the IBM Color Graphics Adapter. Here's why.

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Our efficient use of an XT's slots is not the only reason to buy a Hercules Color Card instead of IBM's. We give you a parallel printer port at no extra cost. (IBM charges extra and takes up another slot.)

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And we'll do just about anything to make our products the most reliable you can buy.



Of course, you will have to give up something when you buy a Hercules Color Card. You'll have to give up software incompatibility. With Hercules, there is none. Every program that runs on the IBM color card will run on the Hercules Color Card.

You'll have to give up IBM's ninety day warranty. Ours is two years.



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Perhaps you don't have funds to invest in the market now but plan to do so in the future. Using on-line financial services today will educate you about managing your investments tormorrow.

GETTING ON-LINE To get on-line you'll need a PC, a modern, and, to access most of the services, a standard communications software package. Some of the services require a particular communications software program to enable you to retrieve information in a particular format these relatively inexpensive packages are usual-information in the on-line services.

ly available from the on-line services.

Sign-on procedures are the same for most services: using your communications software, dial a local-access number and

enter an identification number and password. You're now ready to use the system. To subscribe to an on-line service, you must first pay a registration fee, normally

ting up your account and assigning you an identification number and password assignment. In addition, you usually get a user manual and a few hours of free connect time to help you learn how to navigate through the system without incurring con-

nect-time charges.
From then on you pay for the time
you're connected to the service. Connect
charges are per-minute or per-hour fees for
the actual time you use, based on the time
of day you access the service and the transmission speed of information (the bits persecond). Connect charges are usually
greatest during peak usage hours—busi-

Several on-line services charge a minimum monthly usage fee. If you access these services regularly, though, you'll probably exceed the minimum fee and incur additional cost.

You can minimize the actual time you're connected to anon-line service and keep your charges down by following some simple suggestions. First, always plan your on-line sessions thoroughly before you sign on. With the mountains of financial information at your fingertips, you may be tempted to sign on and go from one feature to another, looking at information that's intriguing but of little practical val-

ness hours Monday through Friday—and ue. Using it this way incurs high costs.

Opical Guide to On-line Services	Cerrent quotes (delaye 15 minutes or more)):	d Historical quotes:				Real-time quotes:			Company information:					Industry Information:					4										
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DOW JONES NEWS/RETRIEVAL

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Journal, Barron's, and the Dow Jones News Service as well as such sources as Standard & Poor's and Media General Financial Services.

Easy to use, DJN/R is completely menu-driven. To access a given database, simply type two slashes (//) and the appropriate mnemonic (for the Dow Jones News database, for example, it's DJNEWS) and



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The manual filing system helped people do incredibly powerful things — like effectively organize their businesses. Yet it wasn't a complicated tool.

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Both programs are designed for people without computer expertise. All instructions are written in plain English so you can be productive right away.

FILE lets you create the filing system that will best fit your particular needs. Unlike other database software, you can design forms any way you want without having to follow a lot of complicated rules.

You can find and print information like mailing labels, client records, inventory lists or purchase orders. Instantly!

REPORT is the perfect companion to FILE. It lets you quickly create summaries of your FILE data with totals, averages, counts and other calculations. So you can get a quick look at the bottom line.

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the DJNEWS database, for example, type //EARN and press the Enter key.

In all, 35 databases are available on DJN/R, grouped into three primary categories: Business and Investor Services, General Services, and Using News/Retrieval. The Business and Investors Services category-our primary interest here-is further broken down into three sections: Company/Industry Data and News. Ouotes and Market Averages, and Brokerage and Stock Symbols, all detailed below. After you know what each database offers, the typical scenario that follows the descriptions tells you how to combine their forces to make them work for you.

The Company/Industry Data and News section contains 13 DJN/R databases that focus on company and industry data and news

■ Dow Jones News (//DJNEWS). The Dow Iones News database itself is cause enough to sign with DJN/R. It gives you what no other on-line service can supply: access to news stories and special features from The Wall Street Journal and Barron's and up-to-the-minute news from the Dow Jones News Service-all as recent as 90 seconds ago and as far back as 90 days.

You can search for the news you want by company, industry, or government category. For company news, type a period, followed by a company's stock symbol, a space, 01, and press Enter to retrieve the first page of headlines for a particular company. You can examine subsequent pages of headlines by pressing the Space bar. To view the complete text for a given headline, simply enter the two-letter code to the left of the headline that interests you and press Enter. The database accesses industry and government news just as easily. To see the first page of headlines for the Office Equipment Industry, for example, type .I/OFF 01 and press Enter.

In addition to being able to access company, industry, and government news, you can retrieve information in a variety of news categories, such as hot business news, headlines of the hour, economic news, monetary news, bond market news. stock market news, news on tender offers. mergers and acquisitions, and earnings reports. The hot business news is a real value, giving you current-day business news that the Dow Jones News Service editors

think can have a strong immediate impact on a company, an industry, the stock market, or the economy.

■ Text-Search (//TEXT), Supplementing the Dow Jones News database is Text-Search, a library of selected news articles that have appeared in The Wall Street Journal, Barron's, and the Dow Jones News Service since June 1979. In addition, all news articles that have appeared in The Journal or The Washington Post since January 1984 are available. Text-Search enables you to search for news using any words, phrases, names, dates, or numbers from the headlines or text of any of these articles. You can design specialized search statements by linking several words together. A powerful research tool. Text-Search can save you a tremendous amount of time and help you make sure you don't overlook important information.

■ Wall Street Journal Online (//WSJ). You can review the headlines and summaries of the major stories from The Journal through the Wall Street Journal Online database. Paying your newsdealer the paper's newsstand price of 50 cents a copy. though, makes a great deal more sense than paying 90 cents a minute (during prime time) to view the headlines and summaries of major stories on-line.

■ Corporate Earnings Estimator (//EARN), Ultimately, the success of any company lies in its ability to make a profit. The price of a company's stock not only reflects the company's current earnings but also its anticipated future earnings. With the Corporate Earnings Estimator database, you can determine what the professionals forecast for a particular company. Updated weekly, this database supplies consensus forecasts of earnings per share for 3,000 widely followed companies based on the estimates of 1,000 top Wall Street analysts at more than 60 major brokerage firms. For each company, the database shows the average of the latest earnings-per-share estimates as well as high and low estimates for each of the next 2 fiscal years. In addition, it gives estimates dating back 4, 13, and 26 weeks, so you can compare analysts' current estimates to

■ Media General Financial Services (//MEDGEN). One of the most useful DIN/R databases is Media General Finan-

their previous projections.

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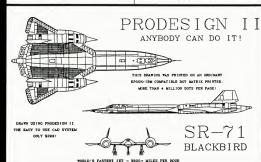
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Weekly Economic Update (//UP-DATE), This database gives you access to important economic news and statistics in a concise, easy-to-understand format. It includes an executive summary of the week's economic news, a day-by-day-trap-up of the past week's events, the

most recently released economic indicators, an analysis of the week's most important economic topics, and a calendar of economic indicators to be released during the next month.

■ Economic and Foreign Exchange

Survey (//MMS). For a more extensive look at the economy, you can access the Economic and Foreign Exchange Survey database supplied by Money Market Services Inc., composed of a weekly dealer survey of the domestic money markets and U.S. economy and a foreign exchange survey. This database provides a table comparing the median forecast for numerous monetary and economic indicators with the latest actual figures released by the government. The forecasts are based on a survey of economists and money market dealers at 50 leading financial institutions in the United States. For each of the indicators' forecasts, you can obtain a bar chart, showing the distribution of forecasts by the 50 survey participants.

■ Online Dictionary of Investment Terms (//DEFINE). Adapted from the book The Words of Wall Street, recently uptilished by Dev Jones-Irwin, a subsidiary of Dow Jones & Co. Inc., this data-base is directly a complete of the information contained in the data-base is not updated and the book is a what has eit in updated and the book is a validable in paperback for only \$9.95 at virtually yany bookstore, buy the book and the validation of the property of the pr

■ Wall \$treet Week Online (//WSW). The Wall Street Week Online database includes full-text transcripts from the popular PBS television program "Wall Street Week." Commentary from the show is broken down into four sections: host Louis Rukevser's Commentary, Panel Discussion, Viewer Questions, and Guest Interviews. Verhatim transcripts of the four most recent shows are kept on-line. The cost/benefit of using this database is questionable. You'd probably be better off watching the television show or obtaining a written transcript of the show directly from "Wall Street Week" for a couple of dollars.

■ Japan Economic Daily (//KYODO). This database offers major economic, political, and business news from Japan. Provided by Japan's Kyodo News Internation

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al Inc., it gives you the day's top news stories, a section on the Tokyo financial markets, and a section of general economic, business, and political news-all available at the end of Japan's business day (9) a.m.-eastern standard time).

The Ouotes and Market Averages section has six DJN/R databases that give you current and historical security quotes:

■ Current Quotes Enhanced (//CQE). With this database, one of the most frequently used of all the DJN/R databases, you get prices on common and preferred stocks, NASDAO (over-the-counter) stocks, warrants, options, corporate bonds, foreign bonds, mutual funds, U.S. Treasury issues, and government securities. All prices are delayed a minimum of 15 minutes. The database also has a useful news-alert feature that automatically advises you when the company you are looking at is making news. Once alerted, you can access that news through the Dow Iones News Service Obtaining current quotes is simple.

You type a stock symbol and press Enter to see the previous day's closing price, current day's opening price, and the high, low, and last price quoted along with cumulative trading volume. You can obtain current quotes for up to five securities at a time by pressing the Space bar between each symbol. Numerous investment software packages, such as Dow Jones Market Manager Plus, automatically access this database to update information on securities.

- Real-Time Quotes (//RTQ). If you want prices on stocks without the usual 15minute delay, you can pay an additional monthly charge and access this database. Real-time quotes are available for all stocks trading on the New York, American, Pacific, and Midwest exchanges.
- Historical Quotes (//HQ). This data base gives you historical stock quotes: daily quotes, available for one year; monthly quotes, available from 1979; and quarterly quotes, from 1978.
- Futures Ouotes (//FUTURES). Current-day commodity quotations from the major North American exchanges are available through this database. You can retrieve prices for more than 80 commodities on a delayed basis of 10 to 30 minutes. Information on each contract includes de

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high and low; volume; and open interest. ■ Tracking Service (//TRACK). With this database you can monitor quotes and news on up to 125 companies by creating up to five lists of stock symbols with a maximum of 25 stocks in each list. You can automatically retrieve current quotes and news for all companies in your list rather than having to request information for one company at a time.

■ Historical Dow Jones Averages (//DJA). This database enables you to obtain the Dow Jones Index for 30 industrial stocks, 20 transportation stocks, 15 utilities, or the composite of all 65 for any specific day during the last year.

The Brokerage and Stock Symbols section contains DJN/R's brokerage database as well as a stock symbols database, part of the Using News/Retrieval category, that

makes using the other databases easier: Fidelity Investor's Express (//FI-DELITY). For the most part, there's little difference between one on-line brokerage service and another. And there's little reason why there should be. Fidelity Investor's Express is no exception. It does exactly what you would expect by enabling you to enter or cancel orders for stocks and options, as well as view your open orders and account information. In addition, you can maintain on-line portfolio records that are automatically updated as security prices, dividends, and holding periods change and when trades are executed

through Fidelity Investor's Express. ■ News/Retrieval Symbols Directory (//SYMBOL). To obtain news, quotes, and other information from various DJN/R databases, you often need to know a company's stock symbol or industry code. You can use the News/Retrieval Symbols Directory to look it up quickly.

A TYPICAL SCENARIO We all get "hot" stock tips from friends and coworkers. Sometimes these tips are good, but more often they don't work out. Nonetheless, when someone tells you about a company that's "going to be the next IBM," it's hard not to get excited and want to get in on the ground floor. The next time this happens, spend a few minutes on-line with DJN/R and check out the company before you invest your hard-earned money. Let's assume a friend calls to brag about

stock he owns in Possis Corp. He doesn't really know what the company does, and he doesn't care. As he puts it, "I've more than doubled my money in the last 6 months, and my stockbroker tells me it will probably double again in the next 6 months." Not having the blind faith of your friend, you decide you want to know more about the company before investing. So you sign on the DJN/R.

First you access the Symbols Directory (//SYMBOL). Following the prompts, you quickly retrieve the stock symbol, POSS, which you will use to search for more information. You also note that the stock is traded in the over-the-counter market. Next, you access Disclosure il (//DSCLO). After entering the stock symbol, you examine the corporate profile to determine what the company does. It indicates that Possis Corp. concentrates its efforts in the development of proprietary products that require advanced technological, engineering, and manufacturing capabilities. Looking at the balance sheet, you note that the company has assets close to \$9 million with liabilities of \$2.3 million. The income statement for the last fiscal year shows a net loss of over \$400,000 on

Continuing your search, you access Current Ouotes Enhanced (//COE) and note that the stock is currently trading at \$19 per share. Next, you turn to Historical Ouotes (//HO), which shows a rapid increase in the price per share. During the past year the stock had soared from \$7 to \$40 per share, at which time a 100 percent stock dividend was declared. This action caused the market price per share to be lowered to \$20 from \$40 per share, with each stockholder owning twice as many shares as before the stock dividend.

sales of \$3.2 million.

To find out more, you go to Dow Jones News (//DJNEWS). A recent news article appearing in Barron's notes that with the stock at 19 times sales and an infinite multiple of earnings, the investment risks are very high. Although Possis Corp. is now specializing in engineering-orientated R&D that could result in substantial earnings, the company has earned less than \$250,000 from continuing operations in its last 5 fiscal years combined.

At your final stop, Corporate Earnings 1 Estimator (//EARN), you find that a consensus forecast of earnings per share is not available for Possis Corp. With the facts in front of you, you are in a much better posi- decision in a matter of a few minutes.

tion to make an investment decision, one not solely based on a hot tip from an acquaintance. Using DJN/R, you have been able to extract the information vital to your OTHER ON-LINE SERVICES In addition to Dow Jones News/Retrieval, a number of other on-line services are available: CompuServe Information Service and The Source for on-line information: The Equalizer from Charles Schwab & Co. Inc. for electronic brokerage; Telescan for on-line charts: NewsNet for on-line newsletters: FCI-Invest/Net: The Insider Trading Monitor and Vickers On-Line for insider trading information: Warner Computer Systems Inc., Commodity Systems Inc. (CSI), Merlin Dial/Data, and Nite-Line for historical quotes; Huttonline for clients of E.F. Hutton; and Vestor for investment advice. None of them is as comprehensive a source as DJN/R, but when used for their specific purposes, they complement the features of DJN/R.

COMPUSERVE INFORMATION SERVICE

Although since its inception in 1979 CompuServe has had a reputation as an on-line service for computer hobbyists, it actually offers a wide variety of information to investors. As with DJN/R, you can retrieve current and historical prices for securities, descriptive company information, financial statements, and earnings estimates. Unique to CompuServe is its securityscreening feature, which allows you to search through the 46,000 securities actively traded in the United States and Canada to identify those that best meet your predefined criteria.

Suppose you want to locate all common stocks traded on the New York Stock Exchange having a market price less than or equal to \$20 per share, an annual dividend greater than \$2 per share, and a price/earnings ratio of less than 10. After signing onto CompuServe, you select the securityscreening choice on the Investment Analysis menu. From the first screening menu. you select common stock for the issue type. Other available issue types include preferred stock, warrants, convertible bonds, municipal bonds, corporate bonds, mutual funds, and put and call options. Selecting common stock narrows down the population of securities to approximately 12,600 from over 46,000. The next choice you make is the exchange from which you want the stocks screened. More than 1 exchange can be selected from a list of 17. In



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this case, you select the New York Stock Exchange and reduce the population of securities to about 1.550 issues.

Continuing the search, you identify the specific criteria that you want to use to screen the remaining 1,550 securities. For all issue types, you can narrow down the search by industry (using SIC code) or Standard & Poor's quality rating. You can screen stocks on indicated annual dividend, recent earnings per share, number of shares outstanding, volatility (beta coefficient), and price/earnings ratio. You can select debt issues by amount outstanding. maturity date, bond coupon rate, yield to maturity, or Moody's rating. You can screen options on open interest, exercise price, or expiration date. In addition to identifying the specific criteria, you specify the range into which you want each of the criteria to fall. In this example, you designate a market price less than or equal to \$20 per share, an indicated annual dividend greater than \$2, and a price/earnings ratio of less than 10.

At this point, you've narrowed the list of stocks to 16. You can further research each of these stocks one at a time before you make your final investment decision.

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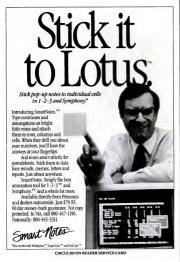
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NewsNet also has an electronic clipping service called NewsFlash. You can maintain an on-line file of up to ten key words or phrases, and NewsNet will automatically search all new stories entered throughout each day. (More than 2,000 new stories are added each business day.) Each time you sign on to NewsNet, it gives you the headlines for stories that have matched your key words or phrases since your last on-line session. There's no extra charge for this service, even though it can save you a tremendous amount of on-line time.



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PC MAGAZINE MAY 27, 1986

Now, let's move to the next page and look at Author, the executive's word processor.

FCI-INVEST/NET: THE INSIDER TRADING MONITOR

Investors follow the actions of insiders, such as company officers and directors, to try to get a clue about how a given company is doing. The theory is that insiders have advanced knowledge of the condition of a company. When good news is forthcoming, insiders tend to buy stock in their company. When bad news is to be released, insiders often sell, FCI-Invest/Net: The Insider Trading Monitor allows users to track the stock actions and holdings of officers, directors, and beneficial owners of over 7,500 companies on the New York and American Stock Exchanges as well as many securities traded in the over-thecounter market.

Using The Insider Trading Monitor is simple. You access insider trading information by stock symbol, company name, or the name of an insider. When you enter a stock symbol, you can obtain, for examnle, a report of activity for your choice of the last 1, 3, 6, or 12 months. For each transaction the report generated will show the insider name, relationship to the company, date of the transaction, number of shares bought or sold, the price at which the shares were purchased or sold, and the number of shares the insider owns after the transaction. You can also get a list of stocks showing the issues with the most insider-buying at the top and the most insider-selling at the bottom. The program can generate a similar list for industry groups.

VICKERS ON-LINE

This database offers inside trading information in the similar to that of The Insider Trading Monitor, but it so nt as easy to use as that program. Vickers On-Line does, however, offer valuable additional information pertaining to institutional holdings. Large institutional holdings of a stock can cause the volatility of its price to increase. By entraing a stock symbol, you can retrieve information for your choice of all institutions owning the selected stock; only institutions

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buying the stock between two reporting periods; only institutions selling the stock between two reporting periods; institutions owning large blocks of the selected stock; or a summary report.

HISTORICAL PRICING INFORMA-

TION Historical pricing information is vital to investors wanting to prepare charts for analytical purposes. One weakness of DJN/R is that you can retrieve only I year of daily historical prices. Another is that certain items, such as commodities and stock indexes (other than Dow Jones), are not available. Thus you may need to supplement DJN/R with a service that supplies additional historical pricing data. Several on-line services offer historical pricing data as their primary product: Warner Computer Systems Inc., Commodity Systems Inc., Merlin Dial/Data, and Nite-Line. Since retrieving historical prices often requires special software, such as technical analysis software (see PC Magazine. Volume 5 Number 7), the historical database you use will most likely depend on the data format your software package requires.

WARNER COMPUTER SYSTEMS INC.

Historical prices for over \$0,000 securities are available from Warner Computer Systems Inc. For most securities, this service gives you daily historical prices dating back to January 1, 1975. In addition to equivi jssues, books, and mutual fainds, you can access historical data for over 100 stock market indirects, such as the over 100 stock market indirects, such as the Varlow Jones Industrial Average, the New York Skok Exchange Composite, the Sander & Poor's 100 (DEX), and the Standard & Poor's 100 (DEX), and the Standard & Poor's 100 (DEX).

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Commodity Systems Inc. (CSI) is a comprehensive on-line source of commodity data. Through CSI, you can access current and historical princing information for over 200 commodities including those traded on the Chicago Board of Trade; Chicago Mercantile Exchange; Coffee, Sugar, and Cocoa Exchange; COMEX; Kansas City Board of Trade; Mid-America Commodity Exchange; Minneapolis Grain Exchange; New York Cotton Exchange; New York Futures Exchange; New York Mercantile Exchanges; and various exchanges in Hong Kong, London, Paris, Singapore, Sydney, Tokyo, and Winnipeg. The data.

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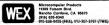
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IN SUM In today's fast-moving markets, access to the latest financial information is vital to an investor's success. Tapping into DJN/R and other on-line services can increase the odds that you'll make profitable investment decisions.

Thomas A. Meyers is an investment technologies consultant in Lawrenceville, New Jersey.

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79.

PRINTER BUFFERS: PRODUCTIVITY TOOLS



A printer buffer, whether built into your word processor, bundled with your memory board, or standalone, can cut down on the time your computer is unavailable.

It's not enough that you have to put up with the constant squeak, chatter, and clatter of your primer. You also have to add change paper, clear paper jams, change ribbons or toner cartridges, and interpret balky printer control-character sequences that don't always get along with your word processor or other product that prints your reports.

Worst of all, you have to put up with the fact that printers are the slowest means hiding your fact that printers are the slowest means biding your time and finding something else to do while your printer turns your work into the hair Copy everyone expects computers to produce. It wouldn't be so had if you could be some maintenance work, like making the critical backup of your hard disk you'r recovery to be a support of your printer to be put and the printer to your printer to pay any attention to your ministrations, pleas, or creders.

So what do you do? Read trashy nocis? Drink galnos of coffee? That's not necessary if you get a printer buffer for necessary if you get a printer buffer, also known as a spooler, is a hardware or software product that allows your computer to keep on working on other jobs while your printer is slogging along in the background. A variety of good printer buffer designs are available, and it may even be advantagous to have more than one on hand to suit different printing situations.

Software print buffers are designed as part of an applications program or attached to the DOS operating system. In either case, the trick is to program your PC's 8088 processor to pay attention to the printer while you're busy trying to figure out what to do next and to pay attention to the command at hand when you type something in.

sometiming in.

The program builds a queue (sometimes called a spool) of characters scheduled to be printed and picks them off to
send them to the printer one at a time (the
only way the PC's printer interface logic
can handle them) while it's not busy doing
something else. The job of sending characters to the printer is abandoned momentarily whenever there's something more important to do.

ON DISK OR IN MEMORY The print queue can be on disk or in RAM. Most programs I have worked with use the disk drive so as to conserve your PC's 640K bytes of RAM for more important things, like the file you're currently working on. Some programs use DOS's built-in diskbased print queue (see sidehar, "PRINT-

■ There are no standards for how to implement an applications-based print queue; programs have a variety of rules you have to live by. .COM: The Background Print Utility DOS Gives You for Free"), while others roll their own

This strategy is a rudimentary form of "time sharing" or "time slicing" the computer resources at the program's disposal. The 8088 has no hardware support for this maneuver (the AT's 80286 does, but it's not used by DOS), but a good programmer can fix a program to do the job in software.

Print spoolers are typically housed indatabase management systems don't generally include them, although the Microsoft Windows operating environment contains a print buffer that may do the job if you use a product that works with it. Several popular word processors have a "print while editing" capability (the PC Magazine Llabs Expanded Fact Files in Volume S Vumber 2 will tell you which ones).

There are (of course) no standards for how to implement an applications-based print queue; programs have a variety of rules you have to live by. Some only allow you to print a file you're not currently working on while others only allow you print the one you are working on. Still others allow you to print a file you haven? I went thought about working on before you decide to print it. The rules are strictly up to the product? is developer.

GENERAL-PURPOSE SPOOLERS A more sophisticated approach is a generalpurpose print queue that can be accessed by any program you run on your PC. Pro-(continues after "PRINT.COM" sidebar)

GETTING THE MOST FROM AST'S SUPERSPOOL PRINT SPOOLER

SuperSpool is one of the most popular printer buffers around because it's packaged with AST's popular memory boards. These tips can help you take advantage of it.

Tucked away in the box with virtually every expansion card on the market is some form of print spooler (or buffer) software. Yet how to use it remains one of the best-kept productivity secrets around. One reason is undoubtedly the mysterious, meaningless term "spool." It's an acronym, so I'm told, for Simultaneous Peripheral Output On-Lind

FOOLING THE COMPUTER What spooler software does is foot the computer into thinking a chunk of memory is a superfast printer. The memory quickly sucks up all data destined for the printer than the such as the su

Why don't more people use spoolers? why take up memory, and they re often tricky to install and use. With the advent of memory-mass, extended and expanded memory cards, and spoolers that can take advantage of them, the former problem is essentially solved. The tips that follow should help with the latter.

One of the most popular spoolers is Version 1.4 00 AST Research's Super-Spool, which comes on the Version 5.00 Superpas disk supplied with AST superpassion boards including the top-suline acrystancies of AST's Superspool was expension boards including the top-suline AST Sikh's. Other spoolers supersing AST Sikh's. Other spoolers work similarly but yon means identically. Super-Spool may be an industry best-seller, but its manual is not the industry leader in clarity, and so it makes a good example for these tips:

RENAMING THE BEAST The first thing to do before installing spooler software is to get a copy onto your boot disk. The second thing is to rename it:

REN SUPERSPL.COM S.COM

How come? Most spoolers are command-driven. You have to get at them from DOS. The last thing you want to worry about when you need to invoke the spooler in a hurry is getting your furnbling fingers to type the awkward word SUPERSPL. Having only to enter the single letter S makes things a whole tot faster.

FUSSY LOADING Since spoolers are memory-resident, they tend to be fussy about how they're loaded, and so an AU-

 Spooler software fools the computer into thinking a chunk of memory is

a superfast printer.

TOEXEC.BAT file is a must. Super-Spool demands to be loaded after any AST Super-Dive RAMdisks, and after the nonresident DOS command MODE—LPT: has been invoked. The first three lines of your AUTOEXED. BAT file will probably look sometic like this (remember in all the examples below that if you haven't renamed SU-PERSPL.COM to S. COM, type SUPER SPL instead of SP.

MODE LPT1: SUPERDRV A: [plus parameters]

S LPT1: [plus parameters]

And are there ever parameters! They all follow slashes, and you can get a quick summary by typing

c /o

Most, however, are exceptionally arcane and best ignored. The important ones at bootup involve memory management. The spooler's buffer defaults to 64K. bytes, about 25 couble-spaced pages, unless you specify otherwise with a M-m command, where in site number of kilobytes you choose. The 64K or your choice comes out of your 640K-byte user space—unless you've got extended or counseld emory and specify (F&TM).

ABOVE AND BEYOND If you do invoke that REXTM option with AST's RAMpage! expanded memory board, you first have to load two device drivers at bootup. That's a matter of putting two files, REMM.SYS and REX.SYS, in the root directory of your boot disk and adding the following two lines to your CON-FIG.SYS file in this order:

DEVICE=REMM.SYS DEVICE=REX.SYS n

where n is the number of kilobytes you select. Your n's bould be a multiple of 16 and at least as big as the buffer size you want for the spooler and similar utility software such as KAMdisks. Confusing? computer into using expanded memory, then REX. SYS fools the computer into seeing expanded memory as AT-style extended memory, and finally the spooling the false casended memory in really a resolution of the confusion of the ing the false casended memory is really a fine to the confusion of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of second of second of second of second of second of second of second of second of second of second of second of second of second of second of second

■ PC LAB NOTES

HERE COME THE OPTIONS If you add the /B option in your AUTOEXEC command—something like

S LPT1:/EXTM/B

SuperSpool will count line feeds and formfeeds to keep track of your current and previous pages. If you run into a paper jam later on, you can then issue the command

S/S

to stop the spooler's output. Then you can adjust the printer to the top of the form and call

S/R

or S/RP

The former will begin reprinting at the top of the current page; the latter at the top of the previous page. In general, it's best to turn your printer off and on again before you issue these commands; otherwise, the printhead may be in the wrong place and the first line will arrive askew. On the other hand, you probably don't want to turn off your printer before issuine the command.

S/C

which continues printing where you ordered it to stop.

FURGING THE SYSTEM That's the theory, anyway. Spooler software generally in air the smartest in the world. Reprinting bothed pages can be fify at best. If your spreadshest ended a cut patring containing a line-feed character, that will know off the spooler's page count. If many office the spooler's page count, if the property of the spooler's page count. If the spooler's page count, if the spooler's page count, if the spooler's page count. If the spooler's page count, if the

S/P

(the P is for Purge), which instantly cleans out the print buffer when all else goes awry. Learn to type it in a hurry, or use a macro processor to assign it to a single key. PRINTER CONTROL SuperSpool's current incarnation adds some handy printer control options. To send a formfeed command, you simply type

S/FF

You can also send a string of characters to the printer with the command

S/STRING=p,q,r,s

where p. q. r. and s are decimal equivalents of ASCII characters. You can transilt up to 60 characters with such a command. The trouble is that these direct commands go to the end of the buffer queue. If you've just hailed printing and want to start out by advancing to the top of the form, you'll have to do it by hand. If you've turned off your machine and it needs some sort of setup string to get rolline, it's time for The Bir Pure.

SPEED AND CATCHES The throughput advantage of a spooler may surprise you. A 17K-byte 1-2-3 file (about six pages) whizzed into my spooler in 50 seconds; the READY prompt returned while my daisy wheel printer was still

Spooler software isn't the smartest in the world. Reprinting botched pages can be iffy.

hammering out page 2. You'll get a similar boost when doing things like listing BASIC programs. But that's far more favorable performance than you'll see with word processing programs that do a lot of output formatting on the fly. A slightly better than 2-to-1 increase is the best I've seen with WartSur

There are some catches. Printers with large buffers of their own may actually experience a decrease in throughput when used with a spooler and, of course, they won't respond instantly to commands issued through the spooler.

Spoolers will cause strange interactions with some programs. If your word processor ''remembers'' where the printhead is supposed to be while it's typing a document, interrupting and restarting the process may well result in everything being typed backwards.

Queuing up multiple print jobs can end in disaster if the jobs don't move the apper to the top of the form. And when something goes radically awry while there's data in the buffer, you have to exit the program you're working on to get back to DOS to deal with the spooler. Knowing where to find the printer on/off switch is highly recommended.

SERIAL HEADACHES Scrial printers can be particular headaches. With the AST software, you have to issue a command to redirect LPIT: output to a COM port, along with a set of /RATE parameters like those used with MODE. But there's no way to send unterial initially intended for a COM port through the spooler, so you'll need no recordingure all units of the property of the command of the property of

in your AUTOEXEC.BAT file. You probably won't type it in right the first time, either.

When your printer goes off-line, the spooler simply stores the data until the printer returns to life. If you accidentally hit Shift-PriSc, you send a screenful of data into the spooler buffer. You'll have to go out to DOS and purge it before running the print job you really want.

SuperSpool and other such programs contain features to make sure they don't interact unpleasantly with other memory-resident software. But what I've outlined here is all you should really need to turn some unused RAM into more productivity. If you've got a little time and a little memory to spare, it's definitely worth a try.—Stephen Manes

Stephen Manes is a contributing editor of PC Magazine.

HARDWARE PRINT BUFFERS SAVE PRECIOUS MEMORY SPACE

A hardware print buffer can not only save you time, it can network several computers to one printer.

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printer or plotter, serial or parallel

ports. CIFICLE 621 ON READER SERVICE CARD

Applied Creative Technologies

Requires: Any computer/printer

CIPCLE 820 DN READER SERVICE CARD

10529 Olympic Dr., #101 Dallas, TX 75220

10529 Otympic Dr., #101

Most multifunction cards (such as the AST SixPak or Quadram Quadboard) include RAM-based print spoolers that allow data to be printed while the machine performs other functions. Many word processors include print spoolers for their own files; typically they're identified as having "concurrent print and edit" capabilities.

Another solution is the hardwarebased buffer. Some have only 8K bytes of RAM, enough for about 4 double-

spaced pages. Others, like Quadram's Microfazer II, are available with up to 2 megabytes, enough for 1,000 pages. They share one common trait: they don't use up any of the PC's memory, as a software-based spooler does.

A hardware print buffer can even perform some local area network functions. A printer buffer can potentially partition its memory for different tasks and hook up to eight computers to a single printer,

queuing and organizing data.

Printer buffers can also serve as translator units between parallel and serial environments. For instance, the Universal Printer Buffer from Johnathon Freeman Designs has a parallel and a serial port on each side for input and output. Some buffers are less universal, available in parallel/parallel, serial/serial, or mixed configurations. This capability opens the door for the use of printers, modems, plotters, or any combination.

Some buffers can handle CAD applications or allow a daisy wheel printer to perform dot matrix functions. And although a photocopier is still faster (at 10 pages per minute, that's equal to up to 650 characters per second), users can also program buffers for multiple output

of the same document. -Charles Rermant



FACT FILE

Graphics ConvertaBuffer

- Von Leivendyke Enterprises Silvernine Ave.
- Norwalk, CT 06850 (203) 846-4973
- List Price: \$299; internal, \$349
- Requires: IBM or compatible, parallel port or card slot. CIRCLE 604 ON HEALT R SERVICE CARD
- Microbuffer In-Line Buffer Practical Peripherals Inc.
- 31245 La Baya Dr. Westlake Village, CA 91362
- (818) 991,8700
- List Price: from \$299 for 32K to \$499 for 256K
- Requires: Any printer/computer combination
- CHC. F 623 ON READER SERVICE CARD
- Microbuffer/E Practical Peripherals Inc. 31245 La Baya Dr.
- Westlake Village, CA 91362 (818) 991-8200
- List Price: Serial, from \$159 for 8K to \$219 for 32K; parallel, from \$1.59 for 32K to \$279 for 64K
- iBM PC printer
- Requires: Epson MX, RX, FX, or ORCH \$22 ON READER SERVICE CARD

Buffer Plus Model P, Model P/S Applied Creative Technologies 10529 Olympic Dr., #101 Dallas, TX 75220 (214) 358-4800

- List Price: parallel, \$299; parallel/ serial, \$369
- Requires: Any printer/computer CIPICLE \$16 ON READER SERVICE CARD

Quadram Corn. One Ound Way Norcross, GA 30093 (404) 923-6666 List Price: Parallel/parallel, from \$179 for 8K to \$995 for 512K; serial/parallel, parallel/parallel, or parallel/serial, from \$199 for 8K to

Caddy Plotter Buffer (5t2K)

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ton Instruments (DMPL), Hewlett-

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Model P16 Printer Ruffer Digital Devices Corp.

- 430 10th St. #N205 Atlanta, GA 30318 (404) 872-4430 List Price: \$1,295, Expandable to
 - List Price: parallel/parallel, \$119. serial to necallel, \$139 Requires: Any computer/pri
 - CIFICLE 616 ON PEADER SERVICE CARD

Scooter Multi-Buffer

ohm/Electronics 746 Vermont Ave Palatine, IL 60067 (312) 359 5500

List Price: From \$429 for 64K to \$1,391 for 512K Requires: Any computer, parallel

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Shuffle Buffer Interactive Structures Inc.

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\$499 6w 178K Regulres: Any computer/printer configuration CIPCLE #14 ON READER SERVICE CARD

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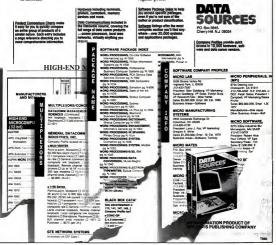
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In fact, SCOUT works with most larger programs including dBase III,
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Waiting for your printer to finish its business can be as discomfiting as waiting for your dog to finish his. Hardware and software print spoolers are available to speed the process and hide it from your view, but before you reach for your wallet to solve the problem, you should take a look at the background printing utility you get free with DOS. It's called PRINT.COM, and in some ways it's the best thing available for letting you do your work at the same time your printer does its.

PRINT works in a fundamentally different way from most software print buffers. Usually, these resident programs allocate a large chunk of user memory to hold the stuff you want to print. Then they intercept the data sent by an application to the printer as fast as the application can send it and temporarily store it in the buffer area of memory they have created. This move frees up the applications program for further work while the print buffer hands the data out to the printer at

a speed the printer can handle PRINT is different. Although PRINT is a resident program like other software print buffers, you'll find it takes up far less memory space because it doesn't have to save the whole file in memory. Indeed, PRINT can only print a file that already exists on your disk. All it needs to do is transfer the file-bit by bitfrom the disk to the printer.

PRINTING A FILE Let's take an example. Suppose you have a normal print buffer installed and want to print a particular file. You would have to execute the command

COPY filename PRN

Now you wait for the COPY command to shovel everything in the file out to what COPY thinks is the printer. This data is actually intercepted by the print buffer and stored in memory. While this process is faster than actually waiting for the file to print, it does take some time. And, you've dedicated some of your memory for the printer buffer to hold the

You might be better off in this situation by simply executing

PRINT filename

PRINT starts up almost immediately and doesn't have to store all the data in the

file in memory. Of course, the fact that PRINT can only print files that have been saved is a disadvantage. Further, in most cases you won't be able to use PRINT to print a file created by your word processor. That's because your word processor probably doesn't store the file in a directly printable ASCII form. (There are ways to get around this latter problem, as you'll see

On the other hand, PRINT is great for printing out programming language source files, such as files with the extensions .BAT (batch), .ASM (assembler),

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■ PC LAB NOTES

("PRINT-COM" continued)

.PAS (Pascal), .C (C), or .BAS (BA-SIC). If you want to print a BASIC program with PRINT, however, make sure you save it with the SAVE command using the comma and A (for ASCII) option after the filename.

FILES FOR PRINT PRINT was dispert to work with ASCII files in which every line is terminated with a carriage return and line feet. The files should be shorter than the character width of your printer. Otherwise, the printer will turneat the lines at the right margin, wrap them to the next line, or print all the excess of the line over at the edge. (Different printers react in varied ways to this mobilem.)

If you're in doubt about whether you can use PRINT with a particular file, here's a simple rule: If you can TYPE it, you can PRINT it. Try the command

TYPE filename

If it looks OK streaming down your screen, then use Ctrl-Break to get out, and then try

PRINT filename

to send it to your printer.

THE PRINT DETAILS The first time you execute PRINT to print a file, you'll get the message

Name of list device [PRN]:

The PRN in brackets means that PRN is the default if you only have one printer attached to a printer port in your system (the usual case), your printer port in your system (the usual case), your printer per in your printer province process Enter. If you have two printers connected to parallel ports, you can press Enter if you want PRINT to work with the first printer; you type in LPT2 and press Enter to use the second printer in-stand. If your printer is connected to assembly the printer is connected to assembly the printer is connected to the first or second serial position.

With the version of PRINT included with DOS 3.0 and 3.1, you can specify

the list device right in the command line the first time you run PRINT, thus:

PRINT /D: PRN filename

In fact, you can even put PRINT in your AUTOEXEC.BAT file, using the simple line

PRINT /D: PRN

This line will load PRINT in memory and set it up to use the PRN device, but it won't start printing anything. After you've specified the list device to PRINT once, you won't have to do so again until

the next time you boot up your machine.
PRINT makes it very easy to print out
more than one file. All you have to do is
list them out on the command line:

■ PRINT is nice and polite. It doesn't splatter all over your screen or pop up in a window just to say "hi."

PRINT filel file2 file3

PRINT will then proceed to print the files in the order you specified and will even send out form feeds to your printer so that each file will start at the top of a new page. And while these files are being printed, you can set up a couple more to be printed by just executing the comment

PRINT file4 file5

They just join onto the end of the queue.

To see what files PRINT is currently working on and which files it has scheduled in the print queue, just enter

PRINT

for a full status report. You can also use global filenames with the asterisk and question mark characters with PRINT. For example, to print your files with a .BAS extension (assuming you used the ,A option when you saved them), enter

The DOS 2.0 and 2.1 versions of PRINT can only hold ten filenames in the print queue. Under DOS 3.0 and 3.1, while the PRINT default is ten, you can change it. The first time you execute PRINT, you tust specify

/0:n

PRINT * BAS

on the command line, where n is a number ranging from 1 to 32. If you've chosen the easy way of putting PRINT in your AUTOEXEC.BAT file, your command line will look like this:

PRINT /D:PRN /0:32

This command loads PRINT, sets it to use the first printer, and gives it a queue size of 32 files.

Here's the most important rule: When PRINT is in the process of printing a file, do not remove the disk the file is on. PRINT needs to access that file regularly until it's finished printing it. This means PRINT (like many other things) is best suited for use with a hard disk, but, of course, you can also use it with a flooply disk system.

HARD-TO-PRINT FILES | I mentioned earlier that you probably won't be able to use PRINT directly with files created by your word processor. Nor can you use

PRINT with 1-2-3 .WKS or .WK1 files. But here's how to get around that limitation. Many word processors and spreadsheet programs have a "print to file" option. You can use such a facility to make a file that PRINT can print. For instance, if you want to use PRINT to, print a 1-2-3 worksheet, just go through the normal 1-2-3 setup procedure for printing, but specify that you want the worksheet sent to a file instead of to the printer. You'll give 1-2-3 a filename, and the program will then store a printable form of the worksheet under that filename with the extension .PRN. Now leave 1-2-3 and execute

PRINT file.PRN

■ PC LAB NOTES

where file is the name you gave it. This can be the same name as the worksheet file from which it came, since the two files have different extensions (.PRN and .WKS).

Of course, if you find this process to be too much of a bother, then PRINT is probably not right for you. You'd probably be better off with a regular old memory-hog print buffer.

SAIPTING PERIORATIONS PRINT will not reset your printer when it starts up, which can be an advantage, as it allows you to send out control sequences to the printer before using PRINT. These forther files that you are printing. However, while PRINT is printing, it will prevent other programs from using the printer. (It does this by signaling that the printer is busy.) This nears that you cannot send out printer control sequences and control printer is busy. This nears that you cannot send out printer out the printing sometime with PRINT of printing sometime with PRINT of printing sometime with PRINT of printing sometime with PRINT of printing sometime with PRINT of printing sometime with PRINT of printing sometime with PRINT of printing sometime with PRINT of printing sometime with PRINT of printing sometime with PRINT of printing sometime with PRINT of printing sometime with PRINT of the printing sometime with PRINT

Öne approach when using PRINT is to put printer courts sequences in small files. You can then include these files on the PRINT command line. For instance, you can make a tiny file called SRIP-PERF that contains the control sequence needed to make the printer skip five lines at the paper perforation. For IBM and at the paper perforation. For IBM and a file with DFIRIG. At the, DOS prompt, you file with DFIRIG. At the, DOS prompt, you file with DFIRIG. At the, DOS prompt, but the properties of the properties of the properties of the proporties.

DEBUG SKIPPERF

File not found -E 100 1B ''N'' 5

"Finism Rafgio" (unimed)
gramm that allow this sexes are either detree drivers for the printer or are loaded astee drivers for the printer or are loaded asterminate-stay-resident programs. In elther case, they usually intercept calls to
BIOS Interrupt 17th, which runs your
BIOS Interrupt 17th, which runs your
and BASIC), When Interrupt 17th and
and BASIC), When Interrupt 17th act
with a request to print characters, the characet to be printed is rerouted to a RAddisk-resident print queue. Then, whenever
the 2088 recessor has tiled time on its

-R CX

сх овор

~

Writing 0003 bytes

Now if you want to print one file normally and a second file with a skipped perforation, you'd run PRINT like this:

PRINT filel SKIPPERF file2

Spend an hour or so with your printer manual and DEBUG, and you can develop a whole collection of tiny control sequence files for a variety of print styles.

STOP THAT PRINT: Sooner or later, of course, while PRINT is churring away and it's got five files in the print queue, you'll suddenly remember that the middle one is no good, You don't want it printed at all and, what's more, Do you let it print anyway and then throw out the paper? Or do you turn off you don't prompter and start all over again?

Neither. Just tell PRINT you want to cancel one of the files. You do this, while it is busily printing what you still do want, by entering

PRINT /C file

where file is the one you want canceled. You can cancel more than one with the command

PRINT /C file1 file2 file3

You can even terminate the remaining

files with the simple command PRINT /T

hands, characters are sent to the printer from the queue.

The strategy is very similar to the one

used inside applications, but it removes the programming and processing burdens from those products. Many multifunction boards for the PC come with a printer buffer as a software "bonus." If you want to see how one works, see sidebar "Getting the Most from AST's SuperSpool Print Spooler."

You'll get a little message on your printer that the files were "canceled by operator." That means you.

What I like most about PRINT is that it since and pointe. Unlike most resident programs, it doesn't splatterall over some screen or pop up in a window just to say "thi." If your printer jams up with paper and you have to shut it down, PRINT doesn't beep at you or freeze your keyboard. It stays nice and quiet. If you want to know what PRINT thinks about the situation, you just execute

PRINT

and it will tell you

Errors on list device indicate that it may be off-line. Please check.

Now that's cool.

Although PRINT's Little Miss Man-

ners style may seem somewhat quaint and old-fishinend, it is extually one of the most sophisticated parts of DOS. Indeed, it's DOS's only true multitasking program. PRINT, in fact, taught Bordand International, the maker of Side/Kick, everything it knows about how remain-resident programs can access files, which is normally not an easy thing to do neasy thing to do.

Although I've discussed the PRINT parameters you'll most commonly use, the version of PRINT included with DOS 3.0 and 3.1 allows you to optimize the program for your specific printer. For full details on how to do this, see my PC Tutor column in PC Magazine. Volume 4 Number 21.—Charles Petzold

Charles Petzold is a contributing editor of PC Magazinc.

ering have their drawbacks. Most applications programs use the disk for mantianing the print queue, and especially if you're a floppy disk user, things can slow down quite a bit whenever the program accesses data destined for the printer. Programs, especially the RAM-resident ones grams, depending the RAM-resident ones your PC's thereby, and if you're a largespreadhere user, that's to precious to give up just to speed up your printing chores.

PC LAB NOTES

EXTERNAL PRINT BUFFERS The third approach to print buffering is to use an external hardware print-buffer device. These modem-sized machines are singleboard microcomputers that include a processor and memory. The type of processor and amount of memory are usually the prime determinants of a hardware buffer's cost. Most models use 8-bit processors and include up to 64K bytes of RAM, good for about 32 double-spaced pages.

Hardware print buffers take your PC's printer output as their input, and output it to your printer at a later time. Their job is to absorb the characters and store them in memory as fast as your PC's printer port can produce them and to print them later whenever your printer is able.

Because they work at computer memory speeds, they are able to absorb printer output nearly as fast as RAM-based software buffers (the speed is limited by the parallel or serial port you are using), but

because they have their own RAM, they don't take up your PC's precious memory. Even though they are a mite slower than RAM-resident programs, they are significantly faster than disk-based software buffers.

External hardware buffers solve the problems found in software solutions but add to the cost of owning a PC. Depending on your needs, however, a hardware buffer may be well worth the cost to you.

WHAT TO DO WHEN YOU MAKE A MISTAKE. There is one problem common to all types of printer buffers that shows up whenever you realize you've made a mistake in your printed work. Once you start the print job going, it moves so fast into the buffer that it will be too late to tell your application to stop things by the time you see the error. By that time, there might be ten or more pages of output sitting in the buffer.

Many products solve this problem with optional commands or buttons that allow you to stop the printer. These may be difficult to use if you have to leave your current application and return to DOS to stop printing from a resident software buffer. but hardware buffers usually allow you to just press a button to kill a print job (and you can always unplug the thing if that doesn't work).

Other options can also be included in hardware or software printer buffers that help you manage your printing chores. Some products allow you to restart the current print job (say a document) if you've had to stop it to clear a ribbon or paper jam. Others just let you restart the current page and some do either. One of the nicer features around is the ability to make more than one copy of any document you print,

Options aside, even the simplest printer buffer can save you tons of aggravation and time.-John Dickinson

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STACKING UP **SUBDIRECTORIES**



Getting back to where you started is a problem with PATH, but with PUSHDIR and POPDIR you can stack directories like cordwood.

ost major programs today support the pathnames and subdirectories of DOS 2.0 (and later). Few, however, make life on a hard disk, with its multilevel subdirectory structure, as easy as it might be. Wouldn't it be nice if you could just type a simple name from anywhere on your hard disk, and your favorite program would run automatically regardless of which directory it was in.

then return you to where you started? PUSHDIR and POPDIR, the two programs you can create from this article, let you do just that. They provide some helpful batch file functions for switching directories automatically, going beyond the limitations of the DOS PATH command. Although PUSHDIR and POPDIR can

be used directly from the DOS prompt, their greatest usefulness is in batch files.

PUSHDIR saves the current directory, and POPDIR restores the current directory from the last PUSHDIR. Space is allocated for up to six directories to be saved, so PUSHDIRs and POPDIRs can be nested un to six deen.

USING PUSHDIR AND POPDIR To use these two utilities to invoke any program (I'll use 1-2-3 as an example) from

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Soure 1: The assembler code for PUSHDIR.COM

PROGRAMMING/UTILITIES



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Bey	word pur [savedint18-	2),en jeers mile
bob.	44	
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244	21h	stormingts and remain resident
ende beni 1		

anywhere on your hard disk, here's what you do:

1. Create a batch file (I'll call this one 12. BAT) with the following instructions:

PUSHDIR (save the current directory)
(CD\LOTUS (change to lotus directory)
123 (start1-2-3)
POPDIR (restore original directory)

 Set the DOS PATH command in your AUTOEXEC.BAT file to include the directory in which you keep the above batch file and also to include the directory where PUSHDIR.COM and POPDIR COM reside.

 Type 12 <Enter> from anywhere on your hard disk and I-2-3 will start.
 The DOS PATH command will find the

12. BAT file and start executing it. PUSH-DIR will save the current directory; CDLOTUS will switch to the Lotts directory; and 123 will start execution of 1-2-3. When 1-2-3 is finished, POPDIR will restore the original current directory, so you'll be back in the same subdirectory you were in before you entered 1-2-3.

Imagine you have been working in your word processor and in its associated directories and you need to quickly update some figures in 1-2-3. Just type 12, update the figures, cxii 1-2-3, and your batch file will

automatically return you to the directory where you were previously working, without requiring you to change a directory even once.

To use this same technique for programs other than 1-2-3, simply create similar batch files (usually all placed in the same subdirectory, so they' lib be found by the DOS PATH command) and substitute the appropriate names for the desired current directory (in place of LOTUS) and the program name (in place of 123).

THE PATH OF NO RETURN By now, someone will be asking whether you can do all this without PUSHDIR or POPDIR, just by using the DOS PATH command. The answer is almost, but not quite. First, you could create a batch file just like the one above, except without the PUSHDIR.

 PUSHDIR and POPDIR provide some helpful batch functions for switching directories automatically. or POPDIR commands. This would automatically start 1-2-3 from anywhere on your hard disk, but it would leave you in the LOTUS subdirectory upon termination, instead of returning you to the subdirectory whence you came.

My Man, you can use PATH to get to the diversion; containing 123 EXE simply by putting the PATH C'ALOTUS command in your AUTOEXEC BAT file. But 1-2-3 starts, the current directory will not be LOTUS, and 1-2-3; like many line to LOTUS, and 1-2-3; like many carried in the current directory. [Utility programs such as IBMF s File Facility as das available to solve this particular difficulty, but not the first.—Ed.]

GETTING PUSIDIR AND POP-DIR. There are several ways you can obtain PUSHDIR and POPDIR. One method is to yee in the assembler code shown in Figures 1 and 2, assemble it with the IBM Macro Assembler or equivalent, indeed, and Aucro Assembler or equivalent, indeed, and with DOS LINK, and then convert it to a COM file with EXEBIN. Alternatively, the BASIC programs contained in Figures and 4 will automateally create PUSH-DIR. COM and POPDIR. COM if you type an ordern, you can download the files tirectly from PC Magazine's Interactive Reader Service by calling (21) 696-6360

PROGRAMMING/UTILITIES



Figure 2: The .ASM listing for POPDIR.COM.

via modem. To load the COM versions of the two programs directly, your communications software must be able to use the Knodem protocol. The BASIC programs can be downloaded, renamed with BAS rather than ASC extensions from ASC, and then run to create PUSHDIR COM and POPDIR are also distributed with the ASC was added to the ASC of the ASC o

HOW PUSHDIR WORKS The first inter PUSHDIR is nut in makes at lavy piece of itself (752 bytes) memory resident. Suspense to the polymer additional memory because the program additional memory because the program conduction of the push

PUSHDIR is actually very simple; the only real trick is to find out if it is already installed and if it is, where it is located, so it can use the already installed memory area. To do this, PUSHDIR attaches a very simple interrupt handler to the Int 16h interrupt. This interrupt is normally used for retrieving keys from the keyboard buffer, but in this case we attach a bit of additional code to it in such a way that we can determine if PUSHDIR is already installed. This additional code does not affect the normal uses of the Int 16h interrupt.

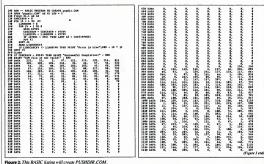
Normally, Int 16h has three subfunctions, which are determined by the value placed in the AH register when it is called. These subfunctions provide programs with

■ PUSHDIR attaches a very simple interrupt handler to the Int 16h interrupt in such a way that we can determine if PUSHDIR is already installed. the means of getting a keystroke (AH=0), checking to see if one is available (AH=1), and checking the status of the shift flags (AH=2). We just add a fourth subfunction that does not interfere with the existing functions but does tell PUSIDs that it is already installed and where its storage memory is located. This routine shown in Figure 1 as the procedure labeled

myint 16. Mvint16 works as follows: First, we check to see whether AX is equal to the new function value, 7788h, If it is not, then we just jump to the old routine without doing anything. If it is, then we test for two more conditions: BX must equal 7789h, and DS:SI must point to the signature string "PUSHDIR VERSION 1.0". These extra tests for BX and DS:SI are added precautions that prevent conflicts should other memory-resident programs do similar things. They also allow you to use exactly the same method on other memory-resident programs by just changing the signature.

If all of the above tests are passed, then we switch the values in AX and BX and set DS equal to the segment value of the interrupt handler—which is also the segment value of the storage table. Then, instead of jumping to the regular Int 16h routine, we

■ PROGRAMMING/UTILITIES



skip it with an IRET.

With this technique in mind, we can follow the steps in PUSHDIR starting at the label BEGIN. First, we jump over the stored data to START. Then we check to see if PUSHDIR is installed by issuing an Int 16h with AX=7788h, BX=7789h, and DS:SI pointing to the string "PUSH-DIR VERSION 1.0". If PUSHDIR is already installed, then the values in AX and BX will be returned reversed and DS will contain the segment of the storage table. The flag [install] will be set to 0, so we know not to install it again upon exit. If PUSHDIR is not installed, then the normal Int 16h routine will just ignore the invalid function value AH=77h: it will return with AX and BX not reversed and we will know that we need to install it when we exit.

For the next part of the program, DS is set to be the segment of the storage area. If PUSHDIR is already installed, then DS will point to the previously installed storage area. If it is not installed, then DS will point to the local storage area in the current program. Since all variable references will use DS as their base segment, we will automatically use the correct storage loca-

In programming terms, PUSHDIR works as a circular stack. The variable [nextpush] contains the address of the location at which to store the next saved current directory. To push a saved directory, we get the address from [nextpush], save the current directory to that address, and

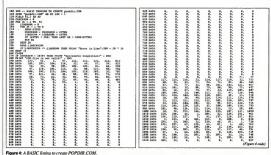
 In this version of PUSHDIR, I have left room for up to six PUSHDIRs. The code can easily be modified to allow space for as many as desired.

increment [nextpush] to point to the next storage location. If the next storage location is past the end of the space we have allocated, then it wraps around and starts again with the first one. In this version of PUSHDIR and POPDIR. I have left room for up to six PUSHDIRs. The code can easily be modified to allow space for as many as desired.

To save the current directory, we invoke the DOS function to Get Current Directory (AH=47h). This function will store the current directory to the location pointed to by DS:SI. It does not return the drive letter, nor does it begin with a backslash, so we leave room to add those subsequently. After a successful DOS return, we use the DOS Function AH=19h to obtain the current drive in AL. This is converted to ASCII by adding the ASCII value for "A" to it, and it is stored in front of the previously returned current directory string (along with the colon and backslash) to give us the full directory drive and path in the form, D:\ pathname.

Next we must update [nextpush] to point to the location for the next directory

PROGRAMMING/UTILITIES



rigure 4.74 Diese inning in treate 1 or Director

save. First, we check to see if [nextpush] is already pointing at the last directory entry. If it is, then we wrap around and set it back to the first directory entry. If it is not, then we just add the length of a directory entry to it and point to the next one.

Finally, we examine the contents of the [install] flag to see whether we need to install PUSHDIR or just exit because it is already installed. If [install] is not 1, then PUSHDIR is already installed, so we just exit with an Int 20h.

If [install] is 1, then we need to install is 1. When the DVSIDIR. To do this, we install the Int 16th interrupt handler by saving the current vector value (so we can chain not to it) and then installing our own. Then we write a brief installation message to the screen, free up the memory used by the DOS entering the properties of the properties of the DVS functional to the properties of the DVS function Call, reserving memory for just the interrupt handler and the sorone area.

HOW POPDIR WORKS POPDIR is just the reverse of PUSHDIR. First, we check to see if PUSHDIR's resident code has already been installed, just as PUSH- DIR itself does. If it has not, we terminate immediately with an error message, because POPDIR can't do anything useful unless it is preceded by a PUSHDIR. If it has been installed, we use the DS register to tell you where it is located so we can get access to the previously saved current discussed.

rectory.

To start a POPDIR, we get [nextpush], which contains the next location at which to save a directory. What we really want is the last location where a directory was saved, so we need to back up one directory storage location. Most of the time we can just subtract the length of each directory lust subtract the length of each directory.

 PUSHDIR.COM and POPDIR.COM tame your hard disk, freeing you from having to manually set current directories. entry, 67, from the current value of [nextpush], but if it is already back at the first storage location, we must remember to wrap back to the last location. With the address of the previously

stored directory, we set the current directory using DOS Function AH=3bh and update [nextpub]. Because the Change Current Directory function does not affect the current drive, we have to get the drive letter from the storage location, convert it to a hex value, and set the current drive using DOS Function AH=0cb.

PUSHDIR.COM and POPDIR.COM ann help you tame your hard disk, freeing you from having to remember and manually set current directories before running you from favorile programs. They can save time and make it easier for you to take full advantage of subdirectories without suffering some of the drawbacks and complications of using the directory structure by itself.

John Friend is an independent software developer and consultant. He is the author of PC-OUTLINE, a shareware outlining and planning program published by SoftWorks Development of Mountain View, California.

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MORE MACROS

The I-2-3 manual says you can have 27 macros in all: \0 for the autoexec macros and the letters \A through \Z. While this seems like a lot at first, as you begin to accumulate them, 27 macros just aren't enough. Also, you can't give macros meaningful names with just one letter.

With the two macros in Figure 1, not only can you have an unlimited number of macros, but you can name your macros anything you want. The trick is to give the beginning cell of every macro a meaning cell of every macro a meaning cell of every macro a meaning cell of every macro and the macro hat prints the worksheet. Instead amacro that prints the worksheet instead calling it V. you could give its first cell the range name Print Out. Then, if you caused you would you would type

Alt-Porint out<Enter>

to run the print macro. In effect, the macro is nothing more than an infinitely variable \xg command.

If typing out Alt-Print is too much work, you can use the menu version of the macro. Aside from the slightly more complex macro, you need a list of the variances you call, with a cell in that list named MACMENU. Now, if you type Alt-M, the currow will move to the macro list. Use the arrow keys to highlight the macro you want to run and hit letter.

W. J. Jhang Cerritos, California

This is very slick. Readers should also note the layout of the macro menu. If you have a

Figure 1: Two macros that increase the possible number of macros in 1-2-3.

large number of macros from which to choose, the most efficient way to arrange them is in the form of a square, with ecell named MACMENU located right in the middle. That way you can get to the one you want without too much key pounding.

MORE ON DATE ENTRY

In the Spreadsheet Clinic of February 11, 1986 (PC Magazine, Volume 5 Number 3), you ran an item about entering dates in

7), you tail an included macro #1 in Figure 2.

This is certainly a good way to enter dates in a column of cells, and when you have finished, you can get out of the loop with Crt-Break

I have found, however, that the second macro in Figure 2 is a very useful variant when you need to enter an ascending sequence of dates that runs through more than a year. You name a cell in the work-seet YR and enter the numerals for the earliest year. Then hit Alt-B to start the date entry loop. When your series of dates gets to the next year, hit Crt-Break to end to loop and Alt-Y to go to the next year.

and get back into the date entry loop. The [edit] [cale] sequence is necessary in this macro because without it all the dates you have already entered will change when the year is incremented.

Alex Kotar San Francisco, California

The second macro is very convenientmore so, even, than you suggest. What I find must interesting about it is the use of the Data Fill into change the unnerals for the year. This can be generalized at a counter when you have a macro that has to run a certain number of times. In BASIC, for example, to increment a counter, you put a statement such as LET A = A+ I had, a loop. Since 1-25 can't do that, most macro writers give their counter a nume converse when the properties of the counter as the generic such as and then employ a sequence such as and then employ a sequence such as

{goto}COUNTER

{edit}+1^{edit}{calc}^Using the |Data Fill technique, you could

■ SPREADSHEET CLINIC



Figure 2: Two date entry macros.

do the same job with the following:

This not only uses less code but leaves the cursor in place, so you don't have to put in another (golo) to get back to whatever it was you were doing before you incremented the counter. And it's almost as easy as BASIC

BLANKING THE SCREEN DURING MACRO EXECUTION

Like other 1-2-3 macro programmers, I have often wanted to be able to blank the screen during macro execution. Release 2 lets you do this with a macro command, but I have found a way to do it with Release IA.

The trick is to create two windows. The first, which takes up all but one row of the screen, contains a message to the user that calculation is under way. The second contains the executing macro. The problem, so far, has been that there is no command in 1-2-3's macro language that switches windows (F6). Using Joseph Fusco's technique from Spreadsheet Clinic (PC Magazine, Volume 4 Number 22, page 208), I was able to create a window command by importing an ASCII 18 character into the worksheet and putting it into a macro. Figure 3 shows the DISP_MSG macro I call from each time-consuming macro routine. The single character in lines 3 and 5 of the macro is ASCII 18. DISP MACRO displays the message

screen in Figure 4, and in the last line returns control to the macro that called it. The main macro executes "off-screen." When it is finished, it should contain a routine that beeps and removes the message screen. 1-2-3 applications a very professional look and has another benefit as well: you will find that most macros will run faster because they won't have to update the full screen.

Brad Stephenson Jenison, Michigan

This is an excellent use of this undocumented macro command feature. Fusco created ASCII characters to import into a worksheet by writing a BASIC program that writes a 1-2-3-readable .PRN file. Here's a quick-and-dirry way to get ASCII 18 into your worksheet: At the DOS prompt, type

copy con: a:window <Enter>
Ctrl-R Ctrl-Z <Enter>

The second line will appear as 'R'Z, and after you hit Enter, you will get a file on

your A: drive called WINDOW, which contains ASCII 18. 1-2-3 can't read that file, so while you're still at the DOS prompt, type

copy a:window a:window.prn/a <Enter>

The .PRN extension lets 1-2-3 recognize the file as text, and the la puts a Ctrl-Z at the end of is so that 1-2-3 can read the file. Use 1-2-3's iFile Import Text command to read the file and you will have ASCII 18 in your worksheet. Use the iCopy command to move it wherever you need it in a macro.

PUTTING VARIABLES IN MACROS

Symphony and Version 2 of 1-2-3 have a very powerful feature that lets you put variables into macro statements. The first line in Figure 5 is an example of a formula in a single cell that actually becomes a different macro, according to the value in COUNTER. The different forms the macro can take are governed by COUNTER's effect on the (ie-choose function and are listed in the table. To make the formula work in Symphony, replace the initial / with (inexus).

This example does nothing more than copy a range (EAST, WEST, or CEN-TRAL) to another range, beginning at cell A10. However, you can use the same technique to modify macros in any number of ways. The trick is to combine strings with



This two-window technique gives your | Figure 3: This two-window technique enables you to blank the screen during macro execution.



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Figure 4: The message screen that is displayed during calculation of the macra shown in Figure 3.

the ampersand (&) character and to make use of the @choose function to modify the contents of the macro according to the value in another cell. There is one thing you should watch out

for when the worksheet is set for manual recalculation: the macro statement will not reflect the current value of COUNTER until it has been recalculated. If a global recalculation isn't feasible during macro execution, you can recalculate specific cells with {recalc}.

R. I. Fugler Montreal, Ouebec Canada

This is a quick, effective way to make macro execution reflect changing conditions within the worksheet. You could put several @choose functions within a single formula to radically change a macro's behayior. This technique avoids the bother of having to write a series of (a if statements.

HIDING SPREADSHEET NOTES

Spreadsheet Clinic (PC Magazine, Volume 4 Number 23) contains a good technique for hiding notes within a 1-2-3 spreadsheet. [The trick is to start the text of the note with a backslash (\) and as many spaces as there are characters in the notes column. That way, the note will be invisible even if there are blank columns to the right into which the note would otherwise spill over .- Ed.1

This is a good method for keeping notes tucked out of the way but not for hiding them completely. If, for example, you move the cursor to the cell containing the note, you'll be able to see its contents in the control panel. Also, if you increase the column width, the note will appear within the spreadsheet.

If you really want to hide notes from all but the most determined snoops, start them with 72 spaces. That way, if you move the cursor to the note cell, the only indication that there's anything at all in the cell will be a single, unobtrusive apostrophe in the control panel. To see the note for yourself,

iust hit Edit (F2).

Don Ford Sacramento, California

These two notation methods are appropriate for different purposes. The first is a way to include useful information that you don't mind other people seeing. The notes are "hidden" only to keep them from cluttering up the screen. Mr. Ford's method is for hiding things so that only you can find them, and it's very effective. It's too bad it works only for labels; it would be nice to be

able to hide formulas this way as well. CONTRIBUTE TO THE CLINIC

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+"/c"&#choose(COUNTER, "EAST", "WEST", "CENTRAL")&""Al#"" COUNTER MACRO STATEMENT CEAST ALC: /cWEST-AL8-/ccentral" Alf"

Figure 5: A farmula that produces different macra statements, according to the value of COUNTER.

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Power user



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FRONT AND CENTER

The border-color patches published in the Power User and User-to-User columns of PC Magazine (Volume 4 Number 25) wouldn't center my several-year-old CRT text display properly. MODE COM could be used to solve this problem, but that approach involves using a batch file and causes the resident portion of MODE-COM to be loaded.

I decided to write a short assembler rou-

A 188
JMP 348

A 348
MOV BX,8885
MOV AH,88
INT 18
MOV DX,83D4
MOV AL,82
OUT DX,AL
INC DX
MOV AL,56
OUT DX,AL
JMP 3AB1

Q

Figure 1: SCRIPT.WS script to add o purple border in WordStar and center the image on certain files resem. Live WordStar is *n mode or DOS's COPY CON: to create the file: make sure you include blank lines after the wol MP instructions and hit the Enter key after exch line: especially bleak store. Then put this SCRIPT.WS file: a capy (not the ariginally our WS. COM WordStar program, and DEBUG. COM on your disk, and get into DOS and type DEBUG. WS. COM SCRIPT.WS.

tine to do the work. Unable to find a BIOS interrupt that made such an adjustment, I constructed a procedure to access the I/O ports of the 6845 CRT controller directly and chance the appropriate register.

The addresses for the I/O ports of the controller are at &H03D4 and &H03D5. Although the 6845 controller has 18 internal registers, shifting the display requires modifying the contents of only one—register number 2 (horizontal sync position).

If you want to both set the boder color and center an off-center display from in-side WordSur, type the script in Figure 1 and name it SGNIFT WS. You can use WordSur's nondocument (N) mode or the DOS COPY CON. Eailty. Make sure of the body of the

DEBUG WS.COM <SCRIPT.WS

The instruction that actually tells the video hardware how much to move the screen image is MOV AL,56. Using a higher number than 56 moves the screen to the right. Unless you have a technical manual for your color card and monitor, you will have to experiment with these values to get your screen just right.

You can adapt this to create a short SHIFTER.COM file that will center the screen for all applications that do not write to register 2 of the 6845 controller. Type in the script in Figure 2 and call it SCRIPT

.NEW. Then put SCRIPT.NEW on the same disk as DEBUG.COM and type

DEBUG <SCRIPT.NEW

You can then center the screen whenever you're in DOS simply by typing SHIFTER and hitting Return.

David R. Burford Mobile, Alabama

We didn't have this centering problem on our IBM color-graphics adapters and

N SHIFTER.COM A MOV DX, Ø3D4 MOV AL, Ø2 OUT DX, AL INC DX MOV AL, 56 OUT DX, AL INT 28

RCX C W Q

Figure 2: SCRIPT.NEW script to create o standalone SHIPTER.COM utility to center the screen image in DOS. Use WordStar's N mode or DOS's COPY CON: to create the file: make sure you include blank lines after the INT 20 instruction and hit the Enter key after coch line, especially the last one. Then put this SCRIPT.NEW file and DEBUG.COM on your disk. set into DOS and you DEBUG

SCRIPT.NEW. Change the 56 in the MOV AL, 56 line if necessary to center the image property; we found 59 worked best on IBM CGMs.

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■ POWER USER

monitors, but this trick will move the screen image on problem displays. And while the SHIFTER.COM utility did its trick also, we found the best value for MOV AL,xx was 59 rather than 56. By the way, Mr. Burford's SCRIPT.WS script changes the border to color 5-purple. If you prefer a different color (we like color 3-light blue), change the last digit in the MOV BX.0005 line from 5 to any other hex number between 0 and F.

DOUBLE HEADERS

WordStar 3.3 users no longer have to feel hampered by the program's inability to print multiline headers and footers. The solution is to use your printer's natural tendency to wrap lines of text that extend beyond the right edge of the paper. If you write an extra-long header on a single line-up to 194 characters-the printer is forced to print the header text on several lines. This technique gives you up to three lines of header and three lines of footer text on each page. The two-step procedure described below assumes the WordStar defaults of 66 lines per page, 65 characters per line, and 10 characters per inch on letter-size paper. With some experimentation, you can make this technique work for a variety of paper formats.

The first step is to write the header line. Since the header line will extend beyond the right margin, it is necessary to turn off the automatic word wrap feature, using 'OW. Then type the header text without the dot command .HE, beginning in column 1 and extending no farther than column 194 (my version of WordStar prints only 194 characters, even though there may be as many as 240 characters onscreen). Remember that the printer will put 80 characters on each line, so you have to design your text to have appropriate break points. When the header text is finished, add the dot command .HE to the beginning of the line to identify it as the header.

The second step is to use the dot command .PL to adjust the paper length. Every extra line used by the header reduces the number of lines available for the rest of the document, and WardStar needs to be told. For a two-line header, use .PL 65; for a three-line header, use .PL 64.

Once these steps are completed, print your document as usual. The enhanced

header lines will work as nicely as if they were a standard feature.

The technique used for making multiple header lines can also be used with equal success for making multiple footer lines. Just be sure to reduce the page length by one for every additional line used by the header and footer texts.

Not all printers work with this technique. The Hewlett-Packard Laserjet, for instance, truncates text that extends bevond the right margin. Users of these printers may be able to accomplish the same effect by embedding printer control codes within the text of the header or footer. Though the details vary from system to

 WordStar 3.3 users no longer have to feel hampered by the program's inability to print multiline headers and footers.

system, it could be done by installing one of the WordStar user-defined print control commands ("PO, "PW, "PE, or "PR) to send the sequence that causes a carriage return and line feed. You could then insert this command into the header or footer text wherever you want the next line to begin.

Wayne Raila Belmont, Massachusetts

Most letters we receive about printer rightmargin wrap complain about the printer line wrap feature; this uses it to ingenious effect. A simple but truly solid idea. Unfortunately, since printers are absurdly nonstandardized, you'll have to experiment with the right settings to make it work. But the results will be well worth the effort.

KEY FUNCTIONS

Jack W. Wright of League City, Texas, submitted a tip that duplicated Ward Starr and Mel Murch's technique in "Notes from the UnderGround WordStar" (Volume 5 Number 2) for adding four entirely new function keys in Version 3.3. However, several of the actual function-key keystrokes suggested by Mr. Wright were worth reporting.

To recap Ward and Mel's trick for adding four new function keys to your standard WordStar, make a copy of WS COM and examine it with DEBUG by typing DEBUG WS.COM. Once you see the DE-BUG hyphen prompt, type

D 649 66D

and make sure all you see are 00s (pairs of

■ WordStar's "go-toend-of-line" command is grossly misnamed. But there's a little-known command that lets you move instantly to the end

zeros). This is the space WordStar provides for nine redundant entries in its keyboard dispatch table. If you see something other than OOs, hit Q immediately and quit. The instructions below will put four new function keys in this area, obliterating

whatever was there.

If all you see are 00s, expand the function key area by typing

E 2431 4A

of any line.

(As Ward and Mel point out, if you're using WordStar Version 3.24, type E 2427 4A instead.)

Mr. Wright's four new keys are

Ctrl-Home = top of file Ctrl-End = end of file

Ctrl-PgUp = begin block Ctrl-PgDn = end block

To implement these, after making the change at 2431 (or 2427 for Version 3.24), type

E 64A 77 88 82 11 12 2A 2A 2A 2A 2E 653 75 88 82 11 83 2A 2A 2A 2A 2E 65C 84 88 82 2B 82 2A 2A 2A 2A 2E 665 76 88 82 8B 8B 2A 2A 2A 2A

Mr. Wright's original tip neglected to include the length byte (O2 in each case above), but we added it. He did suggest to the control of the

E 6B8 Ø5 ØB 44 5Ø 12 1B 2A

The problem with this trick, as Mr. Within points out, is that the R'reenter' shortcut he uses will work fine the first time you edit a file and then hit F9 to print it. But if you're editing a string of files, R will subsequently dredge up the name of the previous file printed. Still, if you work on one file at a time, it's swillth kandy.

Another useful group of function key settings was proposed by Douglas E. Roberts of Columbus. Ohio. who attempted to highican Wordstan 2003: commands for daptican Wordstan 2003: commands for high proposed to key in quick. Succession. The first key marked the beginning of a block with a key in quick. Succession. The first key marked the beginning of a block with a comentional XI. The second key humed down either a period (which ends most sentences) or the beginning of the next extences of the beginning of the next of the block with a XK.) and then deleted the block with a XK.) and then deleted the block with a XK.) and then deleted the block with a XK.)

Mr. Roberts's trick for locating paraghs was unduly complicated. He customized a function key to send "P" P—the undocumented toggle for proportional papering—followed by "I, the tab character, and used this key to begin every paraghab. Locating the start of each new paragraph them meant using "QF to track down each" PP 1-This cluttered formagin with extraneous "P characters and want treathy necessary.

Since users have different editing styles-single spacing, double spacing, indents of various lengths, or no indents at all—there's no universal way to hunt down paragraphs. The method used by most writers we've bumped into is single spac-



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POWER USER

ing text but adding an extra carriage return between paragraphs. This is especially useful if 'JH (help) is permanently set to 0 and the top margin ruler and bottom help line are turned off, giving you a full 24 lines for text. To do this, type

DEBUG WS.COM E 360 Ø E 38B Ø E 248 19

With such single-spaced text separated by a pair of carriage returns, you can find paragraphs simply by answering the FIND? request of "QF with "N" N. (If you indent your paragraphs a standard five spaces, you might want to hit the space bar five times after this string.) Unfortunately, not all users adhere to this style. However, if you use single-spaced text with double carriage returns and five-space indents,

you can prowl through text deleting whole paragraphs at a time just by answering the FIND? query with 'N' Nxxxxx (where each x represents a tap of the spoce bar) and then hitting "KB "L "KK "KY, since the 'L repeats the last search you specified.

A better trick is in deleting a sentence at a time. Mr. Roberts properly points out that you can isolate sentences by hunting for the period at the end, with "OF, "M" M in response to FIND? The problem with this is that sentences don't always end with

An easy way to hunt for and delete sentences is to add four extra function keys on the cursor pad:

Ctrl-PgUp = begin block Ctrl-right arrow = hunt for period Ctrl-PgDn = end block Ctrl-left arrow = delete block

and scan across the right column of the cursor pad to mark sentences, then hit the left arrow key to delete them. It's possible to combine the last two commands to mark the end of the block and then delete it in one keystroke, but it's probably better to have them separate for occasions when you want to mark blocks but not delete them. Again, this is for Version 3.3x; if you're using Version 3.24, substitute 2427 for 2431 in the first line.

	243									
3	64A	84	98	82	88	42	21	2λ	2 A	21
E	653	74	98	85	11	46	28	8D	9A	21
E	65C	76	88	62	8B	4R	2 λ	22	2 A	27
E	665	73	88	85	ØB	19	92	11	58	21
W										

In this example, we added 'B'OP to the final 'KY block delete to clean up the deletion. The 'B'QP reformats the paragraph and then returns the cursor to its previous This will let you hold down the Ctrl key position. This 'B'OP is handy all by itself.

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LONG JUMPS

WordStar's "go-to-end-of-line" command (Ctrl-QD) is grossly misnamed. Once you move beyond the right edge of the screen, the cursor creeps forward in pathetic little 20-column hops. This is very slow, especially when you're working with data files that may stretch past 500 columns in length.

There's a little-known command that sty our more instantly to the end of any line, regardless of length. If your cursor is at the beginning of a line, type Chr.X-A. This takes you down one line, then back-from, the control of the control of the control of the control of the control of the middle rather than the beginning of a line, it's fas-site rot exturn to the beginning of the line. The control of the con

Note that when editing at the end of a file, you must hit the Enter key or Ctrl-N to insert some blank lines after the last line of text, or else Ctrl-X won't be able to move the cursor down a line.

If you're using WordSur to type commandata in avery wide page, it's simple to move between columns, flying quickly over the mass of data that lies in between. When doing columnar work, set mest off to move from tab to tab through your data without showing text forward. Then set several taba at lexy places, such as halfway across and at the right margin. This lets you tab across great massing word-right (Ctrl-A) or and-of-line (Ctrl-QD).

George R. Beinhorn Atherton, California

Ctrl-QS Ctrl-XA is indeed far superior to Ctrl-QD. To customize your function keys so that F7 takes you to the left edge of your text and F8 to the right edge, make a copy of WS.COM, put it on the same disk as DEBUG.COM, go into DOS, and type the following:

DEBUG WS.COM E 6A6 Ø2 11 53 2A 2A 2A 2A E 6AF Ø4 11 53 18 Ø1 2A 2A

hitting the Enter key after each line.

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User-to-user

PC Magazine's readers share their favorite tricks for getting the most horsepower out of DOS, BASIC, and their systems in general.

SCREEN GRARBER

I sometimes want to capture screen images and save them to disk while a porgan sunning, so I wrote a short, memory-resident assembly language program in unning, so I wrote a short, memory-resident Accommentation of the state o

```
.40T-40-column text
.80T-80-column text
.MRG-medium-resolution
graphics
.HRG-high-resolution
graphics
```

The next images will be saved using the filenames "B," "C," and so on with the appropriate extensions). To view any image file, simply set the correct screen most in BASIC and BLOAD the file. For assembly language programmers who wish to save files without a BLOAD beader, delete the lines at DEBUG hex addresses 107–100 and 178–188.

I wrote this program for use only with modes supported by the color/graphics adapter. For the sake of simplicity, it saves only the first page when dealing with text screens (although the program can easily be changed to save all the pages in one file). Finally, certain memory-resident

programs (and programs that use Interrupt 9) may not work with this utility.

k with this utility.
Phillip Cheng
Wayne, New Jersey

We've seen many screen capture programs, but this one is compact and unobtrusive—and its sophisticated detection and marking of screen modes sets it above

```
188 ' Program for creating CAMERA, COM
118 PRINT "Checking DATA statements; please wait..."
128 FOR B=1 TO 13: FOR C=1 TO 17
140 READ AS: IF C<17 THEN 168
158 Z#=Z#+VAL(AS)
160 NEXT: NEXT
176 IP 24=16249 THEN RESTORE: GOTO 266
100 PRINT "ERROR -- WRONG NUMBER OF DATA STATEMENTS,
190 PRINT "OR IN BIG NUMBER AT THE END OF ONE LINE.": END
286 POR B=1 TO 13: POR C=1 TO 16
226 READ AS: TTL=TTL+VAL("6H"+AS)
236 NEXT
246 READ S: IF S-TTL THEN 276
250 PRINT "DATA ERROR IN LINE": 18*10+330
268 PRINT "CHECK FIGURES AND REDO": END
278 TTL-8:NEXT:RESTORE
288 OPEN "CAMERA.COM" AS $1 LEN-1:PIELD $1,1 AS D$
298 FOR B=1 TO 13:FOR C=1 TO 16
318 READ A$: LSET D$=CHR$(VAL("6B"+A$))
328 PUT #1:NEXT:READ DUMMYS:NEXT:CLOSE
338 PRINT "CAMERA.COM CREATED"
340 DATA 89,88,08,08,88,80,80,50,90,50,80,80,80,80,80,80,40,2E,940
350 DATA 80,80,80,80,81,34,30,54,D0,87,83,38,30,54,A0,87,766
360 DATA 85,4D,52,47,80,40,86,48,52,47,88,48,1E,86,58,53,793
370 DATA 51,52,56,57,9C,2E,FP,1E,03,01,B8,48,00,8E,D8,A8,1593
380 DATA 17,88,24,8D,3C,8D,75,52,84,8P,CD,18,3C,86,77,4A,1619
398 DATA 8E,1P,8E,87,BE,14,81,3A,84,76,85,83,C6,86,EB,F7,1279
486 DATA 46,BP,18,81,PC,B9,83,88,P3,A4,PE,86,8E.81,BA.8E,1688
418 DATA 81,81,28,84,3C,CD,21,72,21,8B,D8,B1,87,8B,84,A3,1688
428 DATA 8C,81,BA,87,81,B4,48,CD,21,8B,8C,B8,88,B8,8E,D8,1566
438 DATA 33,D2,B4,48,CD,21,B4,3E,CD,21,5P,5E,5A,59,5B,58,1776
440 DATA 87,1F,CF,33,C8,8E,D8,FA,A1,24,60,2E,A3,63,81,A1,1667
458 DATA 26,88,2E,A3,85,81,C7,86,24,88,2C,81,8C,8E,26,88,731
468 DATA PB,BA,A3,81,CD,27,88,88,88,88,88,88,88,88,88,88,88,88
```

Figure 1: CAMERA BAS program to create the memory-resident CAMERA COM willing for capturing screens in any mode on colorigraphics adapters. Once you run CAMERA COM, save screens by hitming Cirl-Alt-RightShift. Use BASIC'S BLOAD command to display the images, or the CAMLOAD BAS slidethow program in Figure 2. CAMERA COM won't work if certain programs like Stockick are attacked tooled in memory.





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USER-TO-USER

188 ' CAMLOAD.BAS -- by PC Magazine 118 ' Works with P. Cheng's CAMERA.COM.

120 ' Must run this from CAM.BAT batchfile

130 ' on disk that contains three lines: 140 ' DIR ?.* > CAMERA.FIL 150 ' BASICA CAMLOAD

160 ' DEL CAMERA.FIL 170 OLDTIMES-TIMES

180 INPUT "Seconds per slide: ",S 190 IF S<1 OR S>59 THEN BEEP:GOTO 180

200 DIM A\$(26),S(26):K=1 210 OPEN "camera.fil" FOR INPUT AS #1

228 IF EOF(1) THEN CLOSE:GOTO 318 230 T=0:INPUT #1,B\$:M\$=MID\$(B\$,10,3)

248 IF M\$="48T" THEN T=1 258 IF M\$="88T" THEN T=2

260 IF MS="MRG" THEN T=3 270 IF M\$="HRG" THEN T=4 280 IF T=0 THEN 220

298 A\$(K)=LEFT\$(B\$,1)+"."+M\$ 300 S(K)=T:K=K+1:GOTO 220

310 FOR A=1 TO K-1 320 ON S(A) GOTO 330,340,350,360

330 SCREEN 0:WIDTH 40:GOTO 370 348 SCREEN 8:WIDTH 88:GOTO 378 350 SCREEN 1:GOTO 370

360 SCREEN 2 370 BLOAD A\$(A)

380 TIME \$="0" 390 WHILE VAL(RIGHTS(TIMES,2)) <S:WEND 400 NEXT:TIME \$=OLDTIME \$:SYSTEM

Figure 2: CAMLOAD.BAS slideshow program. First, run the CAMERA.COM program created by CAMERA.BAS in Figure 1. Use CAMERA.COM to save several screens in a variety of modes (sample programs in all four modes are shown in Figure 3). CAMLOAD will then display all the

screens in the proper modes for the amount of time you specify. 100 ' 40TEXT.BAS -- by PS 110 KEY OFF: SCREEN 0:WIDTH 40:K=1

128 COLOR 1,8,8:CLS:LOCATE ,,8 138 S\$=CHR\$(286) 148 A\$(1)=CHR\$(201)+S\$+S\$+CHR\$(187)

150 A\$(2)=S\$+CHR\$(188)+CHR\$(200)+S\$ 168 A\$(3)=S\$+CHR\$(187)+CHR\$(281)+S\$ 178 AS(4)=CHRS(200)+SS+SS+CHRS(188) 188 FOR A=1 TO 21 STEP 4

190 FOR B=1 TO 36 STEP 4 200 FOR C=1 TO 4 210 LOCATE C+A-1,B+2:PRINT A\$(C);

220 NEXT: COLOR K MOD 6+1: K=K+1 230 NEXT: NEXT: LOCATE 1 100 ' 80TEXT.BAS -- by PS

110 KEY OFF: SCREEN 0: WIDTH 80 128 COLOR 1.0.0:CLS:LOCATE ..0 130 AS=CHR\$(176):B\$=CHR\$(177)

(Figure 3 continues)

Figure 3: Sample programs for color/graphics adapters in 40-column text, 80-column text, and medium- and high-resolution graphics.

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USER-TO-USER

148 C\$=CHR\$(178):D\$=CHR\$(219) 158 FOR A=1 TO 23

168 COLOR A MOD 6+1,A MOD 5+2 178 FOR B=1 TO 18 188 PRINT AS+BS+CS+DS+CS+BS+AS+AS;

198 NEXT: NEXT: LOCATE 1

188 ' MEDRES.BAS - by PS

118 KEY OFF: SCREEN 1: COLOR 1,8:CLS 128 FOR B=1 TO 75

138 A=RND*388+7:B=RND*138+12:C=RND*5+5 148 FOR F=1 TO C STEP 2 158 LINE (A,199)-(A,B)

168 CIRCLE (A,B),F,(F MOD 3)+1 178 CIRCLE (A+1,B-1),F,(F MOD 3)+1

188 NEXT: NEXT 188 ' HIRES.BAS -- by PS

118 KEY OFF: SCREEN 2:CLS 128 FOR A-288 TO 1 STEP -2

138 LINE (8,A)-(639,A):NEXT 148 FOR E=1 TO 158

158 A-RND*688+1:B-RND*188+1:C-RND*28+5

168 LINE (A,B)-(A+C,B+C),8,BF 178 LINE (A+4,B+1)-(A+C+4,B+C+1),,BF

(Figure 3 ends)

the rest. You can easily combine different screen modes in one slideshow by using a BASIC program like the CAMLOAD.BAS version we wrote in Figure 2. First, run the CAMERA.COM program. Type in the sample programs in Figure 3, or write your own in each of the four modes it can handle Capture screens in different modes by hitting Ctrl-Alt-RightShift when you see ones you like. Then get back into DOS and create a batchfile called CAM .BAT that consists of the three lines

DIR ?.* > CAMERA.FIL BASICA CAMLOAD DEL CAMERA FIL

CAM.BAT creates a file called CAMERA .FIL consisting of the names of the screens captured by CAMERA.COM, and then runs CAMLOAD. CAMLOAD asks how long to view each slide, sets the proper mode, and BLOADS the screens.

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CIRCLE 477 ON READER SERVICE CARD

PRISC FEEDING

The major problem in doing a series of print screens is that every time one finishes you normally have to take the printer offline, hit the form-feed button, then put the printer back on-line. I wanted to find a way to force a form feed after a print screen. and wrote a 77-byte memory-resident assembly-language program called PRTSCRFF.COM to do it. The PRTSCRFF.BAS program in Figure 4 will create it. Run PRTSCRFF.COM once when you boot your computer, and all subsequent Shift-PrtScs will be followed automatically by a form feed.

PRTSCRFF simply calls the original BIOS print-screen routine (Interrupt 05H) and follows it up by sending a form feed to the printer. This is especially useful for the Hewlett-Packard Laserjet printer. The Laseriet's standard print screen is held in a buffer until you take the printer off-line

and press the form-feed button. But with PRTSCRFF the page is automatically printed and fed through the system. Gary Khachadoorian

Weston, Connecticut

If you have to grind out screen dumps, this beats having to go off-line and then on-line repeatedly. However, since screens are 25 lines deep and printed pages a little more than twice that, if you don't have too many to print it's sometimes handy to run off two screens per page.

SCAN CODE SHORTCUT

Most programmers trap extended key combinations such as PgUp, Shift-F1, Ins. or Ctrl-PrtSc with routines like

188 ' PRTSCRFF.BAS -- by Gary Khachadoorian 118 OPEN "PRTSCRFF.COM" AS #1 LEN=1:FIELD #1.1 AS D\$ 128 FOR A=1 TO 77:READ AS:LSET DS=CHRS(VAL("&H"+AS) 130 PUT \$1:NEXT:CLOSE:PRINT "PRTSCRFF.COM CREATED":END 140 DATA EB, 21, 90, 00, 00, 00, 00, FB, 1E, 52, 53, 50, 8C, CB, 8E, DB 150 DATA 9C,2E,FF,1E,03,01,BA,00,00,B8,0C,00,CD,17,58,5B 160 DATA 5A,1F,CF,8C,CB,8E,DB,B0,05,B4,35,CD,21,2E,89,1E 170 DATA 03,01,2E,8C,06,05,01,8C,CB,8E,DB,BA,07,01,B0,05 188 DATA B4,25,CD,21,8C,CB,8E,DB,BA,23,81,CD,27

Figure 4: PRTSCRFF.BAS program to create PRTSCRFF.COM utility. Run PRTSCRFF.COM on bootup, and all subsequent Shift-PrtSes will automatically be followed by a form feed.

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CIRCLE 1SS ON READER SERVICE CARD

■ USER-TO-USER

188 IS-INKEYS 118 IF IS-** THEN 188 128 IF LEN(IS)<2 THEN 188 138 IF ASC(MIDS(IS,2))=82 THEN ...

I've discovered a simpler solution that relies on the MKIS function to convert an integer into a 2-byte string.

If we recode lines 120 and 130 as

128 IF IS-MKIS(4H5288) THEN ...

we can simplify the expression and can pick out what is going on much faster. When INKEYS returns a two-character ("extended") code, the first is always a null, or CHR\$(0). In the &H5200 example above, the 00 at the end represents

CHR\$(0), while the &H52 is the hexadecimal representation of 82 (the Ins key). To use this technique, look up the decimal value of the key or key combination in the BASIC manual chart, convert it to hex.

108 'SCANNER, BAS — by FC Magazine 118 PRINT "Hit cursor pad keys — "; 128 PRINT "Or hit Esc to quit" 138 FOR A-1 TO 18:READ AS:BS(A)-AS:NEXT 148 IS-INKEYS:IF IS-" THEN 148 148 IS-INCEYSIF 150-* THEN 148
158 IF IS-CHRIS(27) THEN END
168 IF LEN(IS)<2 THEN REEF-GOTO 149
178 S-INETS ("GHIERROPOGS", RIGHTS(IS,1)]
188 PRINT BS(8); " key":GOTO 148
198 DATA Home, CHRID, TUD, CALLELT, INB
288 DATA CARRIGHT, End, CorDown, PROM, Del

Figure 5: SCANNER RAS program that illustrates a technique for trapping keys with extended codes (such as Home, End. Ins. etc.).

precede it with a "&H", and follow it with a pair of zeros. This results in BASIC code that is easier to read, easier for the machine to execute, and a lot less typing.

Thomas Tuerke Davis, California

This trick saves typing, but if you're testing many keys with extended codes, you can do a single check for the initial null and use a long INSTR string to identify all the keys quickly. As an example, try the SCAN-NER.BAS routine listed in Figure 5.

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PC TUTOR



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.EXE TO .COM CONVERSION

I've written a number of programs in BA-SIC that I have compiled with the BASIC compiler. But when I attempt to use EXE-2BIN to convert the .EXE files to .COM programs. I get the message "File cannot be converted." Would you explain the conversion process and suggest any possible solutions.

Tom Liss Liste, Illinois

Simply put, compiled BASIC programs in EXE format cannot be converted to a COM format. This is not really a problem, however, since the EXE format files are directly executable by DOS without conversion.

Only. EXE files that have been special by prepared (generally in assembly language) can successfully be turned into COM files. These programs must not contain a stack segment, they must have no references to relocatable segments, and they must begin execution as of ples 100h in the file. Since an executable EXE file must have a stack segment and generally uses separate code and data segments, the two formats are essentially incompatible.

The COM format has a few advantages over the .EXE format, notably a smaller size and slightly easter assembly language programming for small programs. However, .COM files are limited to about 65,000 bytes. (The .COM format was adapted from the CPIM operating system, which had only a 64K address space.)

So, don't be too eager to convert your programs to .COM files. The .COM for-

mai is an endangered species. The mix of the calculation of the segment and the calculation of the segment addresses outside the code segment are two of the major blocks that limit EP programs to I megabite of addressable memory and prevent them from running under the PC AT 80286 protected mode. If a future version of PC-DOS supports the 80286 protected in will probably not support the COM file format at the same time.

AUTOMATING A DOS 3,1 UPGRADE
We recently installed DOS 3,1 on our PC
ATS but had to return to DOS 3 ob ecause
of a change in the way the ECHO command works. We have a great many batch
files that turn ECHO off and then use the ECHO command to display instructions on the screen. We've been using ECHO, followed by two spaces, to create blank lines, but DOS 3.1 gives us an "Echo is off" message on these lines.

■ If a future version of PC-DOS supports the 80286 protected mode, it will probably not support the .COM file format at the same time.

We'd really like to upgrade to 3.1, but we can't unless we overcome this obstacle. Can you help?

u help?
Cynthia R. Collins
West Hartford, Connecticut

Don't let a little thing like this prevent you from upgrading to DOS 3.1. Converting your batch files is an easy job using the search-and-replace function found in many text editions and word processors. Indeed, the conversion is an excellent libatration of a job you can handle rather elegantly using only normal DOS programs and facilities.

The secret of getting ECHO to print a blank line is to see the ASCI (100d 255 instead of a blank. ASCII 255 shows up as a blank on the PC screen, but to DOS, it's a nonblank, so you won't get the unwanted "Echo is off" message. You can create an ASCII 255 at your keyboard by pressing the Alf key, hoping 255 on the number pad (right side of the keyboard), and only then releasine the Alf key.

Some text editors and word processors can handle ASU 1255 and some court, but I'd like to lilustrate the job by using ED.

IN. For a long lime I sparced EDLIN because it's a line editor. I had to use a line editor on a mainframe terminal for years, and once to began using full-screen editors, and using the screen editors, but they are the post really spoled and wowed! I dever go back. But EDLIN is tiny and fast, and idea for doing fix-up joso next files test shound Kill in the control of the property of t

If you edit the batch files in EDLIN, you can do a search and replace to fix up the

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ECHO command with the following ED-LJN command:

1.RECHO <F6>ECHO {255}

The first number means "start at line 1." The missing second number after the comma means to end at the last line in memory. Next is R for 'replace," followed immediately by the old string (ECHO and two blanks). After the old string, press the F6 key (do not type the < and > brackets). It will appear on the display as a "Z. Then type the new string: ECHO followed by a blank followed by the ASCII code 255. Do not type the curly brackets around 255. My notation means instead: Press the Alt key, type 255 on the number pad, then release the Alt key. This, incidentally, will appear as a blank on your display.

Since EDLIN's search and replace is case-sensitive, you'll probably have to do it for lowercase "echo" commands if you've also used these in your batch files.

Now let's take this one step further. Since EDLIN gets keyboard input through DOS (unlike most word processors and text editors), it can be used with redirection of standard input. Begin by creating a small file (with EDLIN, of course) called REPLACE that looks like this:

1. RECHO <F6>ECHO (255) 1.REcho <F6>Echo {255} 1.Recho <F6>echo {255}

Don't type these lines as commands in EDLIN. Instead. go into EDLIN's Insert mode (with the I command), and type them as data into the file. These are keystrokes we'll be using below. Note that I've included three different search-and-replace strings for the three possible ways ECHO probably appears in your batch files. The E command at the end tells EDLIN to end and save.

(If you ever have to edit REPLACE after you create it, use the /B option with ED-LIN. Since F6 is the same as a Ctrl-Z, which normally means "End of File." EDLIN will stop reading the file at the first Ctrl-Z unless it has the /B flag.) Now to change a particular batch file,

all you have to do is enter the command EDLIN batfile.BAT <REPLACE

and DOS will get all the keystrokes from

REPLACE to do the search and replace for

you. Not bad, but I'm not done yet-let's go a step further. Start by creating a one-line batch file (called CHGBAT.BAT) that looks like this:

EDLIN %1 <REPLACE

Then create another one-line batch file called CHGALL.BAT that looks like this:

FOR NAX IN (*.BAT) DO COMMAND /C CHGBAT NAX

Now when you run CHGALL.BAT, it will execute CHGBAT.BAT for every batch file on the disk (or subdirectory), Each time CHGBAT runs, It loads another batch file into EDLIN and uses REPLACE for the keystrokes to do the search and replace.

An interesting side-effect you'll encounter when you go through this process is that some batch files will get edited twice. The reason is that EDLJN renames the old version of an edited file with an extension .BAK. It creates a new directory entry to save the new version. Thus, the FOR command in CHGALL.BAT comes across the file again. You'll also notice that CHGALL.BAT and CHGBAT.BAT will themselves be edited by EDLIN during this process. Neither of these two peculiarities caused any problems when I was experimenting under DOS 3.1. however.

If you have batch files in a lot of different subdirectories on your hard disk, you could use my SWEEP program (PC Magazine, Programming/Utilities column, Volume 4 Number 23) to run CHGALL over all subdirectories on the hard disk with the following command:

SWEEP CHGALL

If you decide to do this, make sure to set your PATH command so that DOS can find CHGALL and CHGBAT from different subdirectories. Also modify CHGBAT BAT to include the specific directory

where REPLACE may be found. After you execute that one command. you can sit back and watch the magic, or you can go to lunch. When you come back, you'll be ready for DOS 3.1.

DIFFERENT BASICS

Recently, I've been trying out some techniques in BASIC that have appeared in User-to-User. Some of them (for instance, unprotecting BASIC programs in Volume 4 Number 25) did not work on my computer, a Compaq Deskpro. Does Compaq's BASIC and BASICA differ significantly from IBM's

Ray Sussman Forestville, California

Yes. The PC-DOS BASIC interpreter for the IBM PC and the MS-DOS BASIC interpreter for IBM-compatible so both come from Microsoft and function similarly. But structurally livey are quite different. In general, techniques that access specific memory locations within the interpreter (as does the "umprotect" scheme) can not be used on both versions of BASIC.

The IBM PC has an entire self-contained (but limited) BASIC interpreter coded in a read-only memory (ROM) inside the PC. For the very early PCs, IBM included this under the assumption that lots of people might be using the PC without disk drives and storing BASIC programs to cassette tape. With marketing assumptions like this, no wonder IBM was surprised at how the PC took off? Even on the PC AT, however, ROM BASIC is still included with the machine. The PC-DOS versions of BASIC and BASICA use routines in the ROM BASIC module. In fact, the PC-DOS BASIC and BASICA interpreters are sometimes referred to as "extensions" of ROM BASIC. This makes the BASIC.COM and BASICA.COM files sharter, but it limits their use to the IRM PC. IBM-compatible machines cannot include the IBM ROM version of BASIC be-

Versions of MS-DOS for compatibles generally come with a version of BASIC called GWBASIC but may also include files named BASICA, which are identical copies of the GWBASIC interpreter. (On the PC, BASIC and BA-SICA are different.) The "GW" of GWBASIC is either the reversed initials of Microsoft Chairman William Gates (better known as Bill Gates), or it stands for "Gee Whit." I nerfer he latter theory.

cause it is proprietary

Since PC-DOS runs on many compatibles, many IBM-compatible users have switched to PC-DOS. The only real problem is that the PC-DOS BASIC interpreters won't work, so they have to use the

GWBASIC included with their compati-

blet MS-DOS.
On a related topic, I've received a number of quasitons about where to bup DOS from redarts who are building wheir on PC-compatibles from this. Microsoft does not sell DOS to be general public leasted it licenses it to companies making MS-DOS computers, but PC-DOS is a multi-table at any IBMF row, but PC-DOS is a multi-table at any IBMF row. For Compatible counter running PC-DOS, Microsoft sells superarely a version of GWBASC that does not not sell the PC ROM BASIC.

WORDSTAR

PROPORTIONAL SPACING

I have been trying to get WordStar proportional spacing and microjustification to work on my 24-pin dot matrix printer and have been unable to do so. The printer is recognized by WordStar as in "auto-install" printer, so I don't think it's an installation problem, but WordStar refuses to microjustify for me. What do I do?

> T. Lee Los Angeles, California

I First, let me clear up some confusion about the differences between proportional spacing and microjustification. They are not the same thing, although they are related.

With microjustification, the word processor insteast stems of space between the letters so that the right margin lines sopsification on any printer capable of horicountily specing in increments of V_{to} or V_{To} inch. Many 24-pin den matrix printers can do this. In the WeedStar installation program, you have to specify a custom stallation for "Specially primer." International processing processing the digiting out control sequences and telling WeedStar about them.

Although I once installed WordStat to interchystiff on a Tothiba 131, I wasn't entirely happy with the results. Since I also set up other print functions so do doublewidth print, WordStat didn't know it was doing double-width and lost track of where it was printing on the page. I personally found it more difficult to read than raggedrish test.

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microjustification. With proportional spacing, i's take up less space than W's . Proportional spacing can be used by itself, without right justification. (This to me is the most attractive.) Proportional spacing can also be used in conjunction with microjustification to achieve a typeset appearance. Many recent printers can do proportional spacing themselves in response to a control sequence. If your printer has this facility, then you need only set up WordStar to initialize the printer with the required proportional spacing control sequence. (But watch out when you're printing columnar data! Proportionally spaced columns look awful.) Proportional spacing in combination

Proportional spacing is different from

microjustification.

with microjustification is more difficult for word processors, since the program must have stored a table containing the relative widths of each character on the printer. Word processors more advanced than WordStar in formatting features (such as Microsoft Word and XvWrite III) have this feature.

WordStar itself does not support proportional spacing-or so MicroPro says. However, WordStar does have the rudiments of proportional spacing logic built in and can manage it under some circumstances. For full information, consult M. David Stone's book Getting the Most from WordStar and MailMerge. The first chapter is entitled "WordStar's Unsupported Proportional Space Print Feature.

You might also want to seriously consider switching to a more modern word processor. Even WordStar diehards will admit that WordStar is not the best choice for doing fancy printing work.

The PC Tutor solves practical problems and explains points of general interest. To see your questions answered here, drop a line to PC Tutor, PC Magazine, One Park Avenue, New York, NY 10016.



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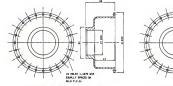
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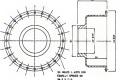
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REVIEWS IN BRIEF

How Secure Do You Want It?

BY JIM FORNEY

Using file-management techniques strongly reminiscent of some popular PC networking systems, Golden Bow Systems' Vfeature and Vfeature Deluxe offer you an extraordinary degree of file security and access control and can be used with multiuser applications built around a single PC or computible computer. Either of these packages allow you to divide one or more hard disks into up to 24 separate volumes of various sizes with DOS 2.0 or later versions, and control user access to these volumes. Volume sizes can range between 33K bytes and 33 megabytes with Vfeature and up to 280 megabytes-far more than a PC will normally support-with Vfeature Delure

Individual volumes can be password-protected using either common or different passwords. You can also either temporarily or permanently write-protect volumes and key read-only volumes to prevent downloading unless a specific password is given, preventing valuable files from being copied to floppy disks. The keyboard can also be locked by the software when a system is left unattended.

Installation of either of the packages, while menu-driven and fairly simple, requires considerable planning to be really effective. By its very nature, neither package is software you can simply run on an existing drive full of files and directories. You have to start from scratch, formatting your hard disk with a special procedure supoiled. After you have

done so, you can allocate your storage space and tack on access control codes as required before loading your files and other software onto your hard disk.

For more efficient use of the storage capacity, especially if you have a lot of small files, the Vfeature packages allow you to change the PG default hard disk cluster size from 4,096 bytes down to as little as 512 bytes. You can also increase the cluster size if most of your files are larger ones. The advantage to using larger-than-default-size clusters is a significant improvement in disk access or software run times.) I found the process of volume size reallocation to be a little tricky.

Whoops! The Spelling Checker That Came Too Late

BY VINCENT PUGLIA

When it named its real-time spelling checker Whoops?, Cornucopia Software may have been alluding to an individual's immediate reaction upon noticing a typo. Instead, it focuses attention on various oddities and possible bugs in the program's design. Unfortunately, as good as Whoops? is—and it is good—these oddities are going to prevent the program from ever becomine a maior reller.

non-two-occuring analyse sector spelling checker that catches errors as you type. It comes with a two-file \$0,000-word dictionary, a file for the most commonly used words, and utility programs for adding words, editing the user-defined dictionary, and customizing the main program. Whopset, is compatible with over-right word processing programs see Indian Medical WordSurv. WordSurv. systems that contain over 256K bytes of RAM, both the program and the dictionaries can be loaded into memory; but they do chew up memory. For example, on a 640K system, I was left with 411K bytes of RAM. Because of its appetite for memory, loading the dictionaries is impossible on systems with smaller configurations.

configurations.

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The diecitory by litting conditions
of the Alf and Shift keys. The options mean
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dictionary, skipping the officinding word for
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Visiture Detuxe can take a hund disk beyond the 12-me outsite LR I's burrier



Whoops, has a fee of leseful features and some quirks ones to

choose which mode to start with, and define the minimum number of letters to be considered a word.

Typos are signaled by beeps (in real-time mode) or highlighting (in screen-proofread mode). If you know the correct spelling, you can correct misspellings immediately. If not, you can switch to the dictionary and either have Whoops! guess at the correct spelling or scroll through the dictionary yourself. Once a spelling has been chosen, the program will correct it automatically. While the program guesses at spellings, it does so on a letter-byetter basis. That is, unlike Borland's Turbo



Whoops! The Real-Time Spelling Checker Cornucopia Software Inc. P.O. Box 6111 Albany, CA 94706

(415) 528-7000 List Price: \$49.95 Requires: 58K RAM, two disk drives, DOS 1.0 or later.

In Short: A real-time spelling checker with a lot of useful features that are unfortunately outweighed by its bugs. Whoops! is not copy protected.

CIRCLE 400 ON READER SERVICE CARD

Lightning, it will not handle transpositions such as "hte" and tell you the correct spelling is "the "

Whoops! also proofreads phrases punctuated with an em dash, such as "good-these" in the first paragraph of this review, as if they were a single word. It does so even if the program recognizes each individual word on either side of the em dash as a valid spelling. Whether you should separate words and hyphens or em dashes is a stylistic decision, not a spelling one, and the programmer should have taken that into account. Also, the program appears to consider deletions and backspacing as part of a spelling (see the screen photo) when they are done before hitting the Space bar. As a result, the word you correct as you type is also flagged.

Finally, when you exit the application program, Whoops! immediately updates the dictionaries on disk from memory, taking full control of the system as it does so. I tend to type ahead of the screen into the keyboard buffer, and so it's extremely disconcerting to suddenly lose control and not know what is going on and how it will affect the next application session.

Whoons! delivers more than is advertised. and I for one am not too ecstatic about the extras. None of the extras prevent the program from accomplishing its task; they just add to your work. I fully expect Cornucopia to address these problems, but until it does, I cannot recommend Whoops!

Vfeature

don't attempt it unless you acquaint yourself fully with the documentation. Once volumes have been allocated and

passwords assigned, you cannot make changes without the use of a special key flopny and a password to assure the integrity of your files. Also, you cannot deinstall Vfeature without downloading your files to floppies, then taking your hard disk back to its original condition, even deleting the DOS partition before running FDISK and reformatting under DOS

Golden Bow's Vfeature and Vfeature Deluxe packages are basically easy to use and offer a high degree of hard disk access control. The programs are especially suited for multiuser environments that share common massstorage devices. One of these might be just right for your security needs.



FACT Vicature and Vicature Deluxe

Golden Bow Systems 2870 Fifth Ave., #201 San Diego, CA 92103 (619) 298-9349

List Price: Vfeature, \$80; Vfeature Deluxe, \$120 Requires: XT-compatible hard disk con-

troller, ST-506-interface hard disk, DOS 2.0 or later, Vfeature Deluxe PC-DOS In Short: File management and acc trol software supporting hard disks to 500

megabytes. Features include selective password protection of up to 24 volumes on hard disks and inhibited downloading to prevent data theft. Both versions are copyprotected.

CIDCLE AND ON HEADER SERVICE CARD.

Break Out of the Post-Test Blues: PC-Inmate Chip

BY VINCENT PUGLIA If you tend to swap boards as often as a chameleon changes color on a multicolored quilt. or otherwise enjoy poking around the innards of your PC, look into JS & J Software's PC-Inmate. This 8K-byte ROM chip allows you to boot un more quickly, lets you use as much as 704K bytes of RAM as main system memory (and you thought 640K bytes was DOS's limit!), automatically blanks your monitor when your keyboard is inactive, puts up an informative configuration display, and lets you easily switch between color and monochrome monitors. Best of all, installation is a snap (figuratively and literally).

Without PC-Inmate, my PC took 60 seconds to run the power-on self-test (POST). boot, and arrive at the time prompt; with it, the system booted within 20 seconds, one third the time. Adding the configuration display option brought the effective time back un to a minute, but in return for the 40 seconds, I now knew which boards and ports were installed and available. Performing the memory

test took 1 minute and 7 seconds To install the PC-Inmate ROM chip, you simply locate the socket on the PC's motherboard labeled U28, orient the chip with the others so that the notch points toward the rear of the system, and snap it gently into place. The only potential problems are the danger of static electricity, and the possibility that you'll bend a pin. In the former case, make sure you have discharged any static before touching the chip. In the latter case, carefully bend the pin back into position, preferably by gently pressing it into shape with a straightedge. (For a fuller look at the issue of static electricity, see Virginia Dudek's sidebar in this issue's cover story, "What About Static Electricity?" especially the section entitled High-Risk Situations.)

After that, you must reset the DIP switches in the second bank (Switch 2) to the off position so that PC-Inmate can locate and configure up to 704K bytes of contiguous RAM. If you intend to use the screen-saver feature. you should also set a DIP switch in the first bank (Switch 1). Both the chip socket location and the DIP switch settings are clearly illustrated in the five-page photocopied documentation that accompanies the \$59.95 ROM chip. The PC-Inmate ROM loads itself into ■ Without PC-Inmate installed, my PC took 60 seconds to run POST, boot, and arrive at the time prompt; with it, the system booted within 20 seconds.

the memory area just below that occupied by the ROM BIOS and above the area usually accessed by EMS boards such as AST's RAMpage!. Therefore, you need not worry about conflicting with anyone clse's RAM area.

Continuing with anyone case's Scots area.

As with all things, though, there are some drawbacks. First, to get quick booting you must disable parity checking. Scoond, if you have a Hercules monochrome adapter, you can damage your monitor by enabling the screen-saver feature. PC-Inmate has a pass fall memory test in response to the first proband recommends that users of the Hercules mono card disable the screen-saver feature because of incompatibilities. (There are no problems with the Hercules color card.)

PC-Inmate is not for everyone, especially if you're leery of going inside your system. But, if you configure systems, want an additional 64K bytes available for your 1-2-3 worksheet, or are just plain tired of waiting for your system to power up, PC-Inmate can make life a great deal easier.



PC-Immate JS & J Software 1281 S. King St., 6A Honolulu, HI 96814 List Price: \$59.95

Requires: IBM PC that can handle at least 256K RAM on the motherboard.

256K RAM on the motherboard. In Short: A useful enhancement chip that permits easy reconfiguration of a PC system

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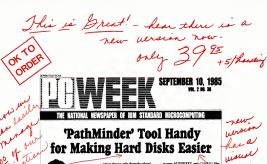
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COMING UP

WORKSTATIONS The 32-bit computer specializing in graphics was until recently a well-kept secret, known only to architects, engineers, and scientists. Companies like IBM and Xerox have begun to redefine the workstation by introducing new machines that have the advantages of workstations-a large, high-resolution screen, multitasking, and a 32-bit processor-and also run DOS. Contributing editor Frank J. Derfler, Jr., peeks into the future of workstations, and Bill Machrone reviews the Xerox 6085 and other new generation workstations.

MORE MEMORY BOARDS Many manufacturers have broken the 640K-byte barrier since PC Magazine reviewed the first batch of extended and expanded memory boards ("Enlarging the Dimensions of Memory," PC Magazine, Volume 5 Number 1). Despite such drawbacks as a lack of DOS support for extended memory and the klutziness of expanded memory's bankswitching technique, boards that increase RAM space are becoming popular add-ons. PC Magazine Labs tests 11 new boards.

FRAMEWORK, SYMPHONY, AND ENABLE FACE OFF Wrapping a database, a spreadsheet, graphics, and word processor up in one package seemed like a great idea to software developers a couple of years ago. But most PC users clung to their tried-and-true standalone programs. and so most integrated packages just sat on the shelf. Enable, Framework, and Symphony bucked this trend. What gives these survivors their staving power? Alfred Poor explores the latest versions.

TURBO PASCAL ADD-ONS Borland International's speedy compiler brought renewed popularity to Pascal. But Turbo isn't without its flaws. Dozens of software publishers have rushed to fill in the gaps with screen generators, program editors, and libraries of routines. Peter Feldmann reviews 16 Pascal utilities.

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